Design of ICT procurement process model for secondary schools in Tanzania

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Abstract

Information and Communication Technologies (ICT) Procurement Process is an important part for schools organizations in developing countries, as after this level of education, students can either continue with studies in higher education or start working. Both cases require people to be literate users of ICTs. The procurement of new technologies, need to target specific processes that fit to local contexts in regards to existing level of available equipment and infrastructures. Literature review on procurement processes in the context of Tanzania indicates the use of centralized and decentralized ICT procurement processes. Through centralization the government has completed procurement of ICT equipment and networked 32 Teachers colleges and started training Teachers who will be future trainers in secondary schools. This will be followed by centralized procurement of ICT equipments for secondary schools, depending on availability of funds. On decentralizations the government has prepared a procurement guideline for secondary education development plan (PGSEDP), for use in individual schools when procuring works, goods and services. Analysis of ICT Procurement in Secondary Schools in Dar Es Salaam, indicates less awareness on the availability of procurement guideline and dependence on using second hand technologies, as new equipments are expensive for schools to afford. Lack of maturity in schools communities on using e-mails in order to source out suppliers of ICT equipments has resulted schools to depend on the supply from different organizations which are established locally. Historical perspective of ICT Procurement in Tanzania indicates that, there was a ban on ICT Importation into the country for 20 years 1974-1994. It is from this context, the author explores the design of an ICT Procurement Process aiming on improving access of ICT equipment for training in Secondary Schools. The focus has been on awareness use of e-mail for internal and external communications in order to increase access to already made ICT technologies. Review on the value of a more network of people in communication indicates that, its value is proportional to the square of number of communicating nodes. Results will be used by educational administrators when making decision on what ICT is appropriate to procure for secondary schools in Tanzania.

Keywords: Design, Procurement, Process, Models.

The ACM classifications (ACM Computing Classification System, 1998 version): K.3.0, D. 3.1., D.2.2., H.1., G 3.

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Abbreviations

MOEC	Ministry of Education and Culture
SME	Small Medium Enterprises
RTD	Radio Tanzania Dar Es Salaam
NECTA	National Examination Council of Tanzania
PDA	Personal Digital Assistant
PPA	Public Procurement Act
PPRA	Public Procurement Regulation Authority
PGSEDP	Procurement Guideline for Secondary Education Development Plan
PBE	Policy for Basic Education
SEI	Software Engineering Institute
RFP	Request For Proposal
TBC	Tanganyika Broadcasting Corporation
TIS	Tanzania Information Services
EAC	East African Community
TPTC	Tanzania Post and Telecommunication
EAP&TC	East African Post and Telecommunication
NIP	National Institute of Productivity
ILO	International Labor Organization
MSTHE	Ministry of Science Technology and Higher Education
ITV	Independent Television
CTN	Cable Television News
DTV	Dar Es Salaam Television News
BOT	Bank of Tanzania

UDSM	University of Dar Es Salaam
TANESCO	Tanzania Electric Supply Company
NBC	National Bank of Commerce
MoF	Ministry of Finance
MoEVT	Ministry of Education and Vocational Training
TPC	Tanzania Post Corporation
TTCL	Tanzania Telecommunication Company Limited
TCC	Tanzania Communication Commission
TCRA	Tanzania Communication Regulatory Authority
TBC	Tanzania Broadcasting Commission
IICD	International Institute for Communication Development
PEDP	Primary Education and Development Plan
SEDP	Secondary Education Development Plan
PGSEDP	Procurement Guideline for Secondary Education Development Plan
HOS	Head of School
SPC	School Procurement Committee
SB	School Board
RTB	Regional Tender Board
MTB	Ministry Tender Board
TCLSSTF	Tanzania Computer Literacy for Secondary School Trust Fund
VSAT	Very Small Aperture Terminal

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1. Introduction

Technology is changing rapidly and one key area to increase access to *Information Communication Technology* (ICT) in the society of both developed and developing countries is through education. The World Bank Survey of ICT and Education in Africa indicates a growing interest in the use of ICT in education [1].

Developing skills, knowledge and understanding of the proper use of ICT prepares students to become literate users of technology in their everyday working environments. However developing countries like Tanzania still depend on the importation of ICT technologies from developed countries. Although ICT has the potential to enhance education, this potential has not yet been realised in practice in developing countries because schools can not afford to buy new equipment.

At the same time, the changes in ICT technologies continue to give more openings for cost effective and powerful technologies of potential use in education. This becomes more challenging to stakeholders planning to adopt the use of ICT in education. There is a continuous gap on knowledge of the available ICTs in the market and what works in specific application. The gap is widely reflected the research literature [2, 3, 4].

Another researcher in Multimedia technologies argues that, historically new forms of technologies never replace the old one, (e.g. TV did not kill radio and Internet did not kill TV), instead new forms complement the old ones and naturally lead to greater choice for people [5].

As a solution for schools to have access to ICT, Cawthera [6] identifies three categories of ICT provision for schools in developing nations as, *using second-hand equipment*, *using refurbished second-hand equipment*, and *using new equipment.* However, caution is given that provision of new equipment is usually found in the wealthy schools, or from centrally financed state provision and cost is one of the hindrances when planning the implementation of ICT in schools in developing countries [7, 8].

Jonathan [9] argues that it is even more important for primary schools to have modern and advanced computers than other levels of education, so as to provide students at this age with a wider scope in learning. Therefore, he discourages policy makers who are still recommending obsolete computers in kindergartens.

The implication of Gordon Moore's Law [10] at Silicon Valley on future development of the semiconductor industry, indicates that the price of new computer models stays high for several months and then falls for a couple of years. The price begins to stabilize after the major consumers and producers have moved to newer technologies, (i.e. when the old computer models are replaced by new ones). This cycle takes 18 months.

According to diffusion theory, the adoption of technological innovations is a function of one's innovativeness, or willingness to try new products [11]. The theory proposes that a small segment of the population (usually less than 3%) accept the risk of adopting a new idea, product, invention or behavior before anyone else, and then if others see the benefits they can obtain from adopting the innovative activity, they also adopt the new idea.

Research on the adoption of e-commerce on Small and Medium Enterprises (SMEs) in the United Kingdom (UK) in 2002 adapted 'a stage model' from Cisco which studied e-commerce in small business and suggested that organizations within electronic industries are at different levels of e-commerce take-up defined by five stages: e-mail, website, e-commerce, e-business and transformed organizations [12]. The first two are the focus of this research, and they are shortly explained below. Figure 22 gives a complete description of the e-adoption model.

The E-mail stage is when people within the organization are mature enough to use e-mail for efficient internal and external communications. The **Website stage** is when an organization has created their website to place their organization in a world wide market, and hence have access to worldwide suppliers.

It is from the above perspective that this research explores the design of an ICT-Procurement Process Model, which will enable better access to ICT for training in Secondary schools. The specific objective is to reflect on Information Technology tools

which are appropriate for ICT procurement to secondary schools at the time of writing this thesis. The results can be used by different stakeholders in education, when planning on procurement of ICT equipment for training in secondary schools.

This study focuses Tanzania and in particular the Dar Es Salaam region. Dar Es Salaam is the largest city among the 26 regions of Tanzania, a former capital city and the current major business city. It is situated in the coastal area, administratively consisting of three municipalities/districts of Kinondoni in the north, Ilala in the center and Temeke to the south of the region. Roughly 2.5 million people lived in Dar Es Salaam in 2005, with an annual growth rate of 4.4%, the population is expected to reach 5.12 million by 2020 [13]. This makes Dar Es Salaam the most densely populated city in the country, which also increases the chances of Secondary schools in Dar Es Salaam having more access and connectivity to the backbone services for ICT. These backbone services consist of telecommunication, electricity, broadband wireless connections.

A selection of respondents from the case study area were chosen from those schools that have already managed to procure appropriate ICT equipments and use them for training. The findings of the study assisted in the design of a suggested ICT Procurement Process Model for Tanzania Secondary Schools.

1.1 Background of the Problem

The structure of the Formal Education and Training System in Tanzania constitutes 2 years of pre-primary education, 7 years of primary education, 4 years of Junior Secondary (ordinary Level), 2 years of Senior Secondary (Advanced Level) and up to 3 or more years of Tertiary Education. In January 2007, there were 251 secondary schools in Dar Es Salaam located in different parts of the three municipalities of Kinondoni (101), Ilala (87) and Temeke (63). Among these schools 123 were owned by the government and the remaining 128 were private schools [14]. ICT for Tanzanian educational purposes started in the early 1960's. Primary and secondary schools were provided with radios to enable students to listen to educational programmes that were designed by the Ministry of Education and broadcasted by Radio Tanzania Dar Es

Salaam (RTD). From late 1990's the Government of Tanzania resolved to set the curriculum to provide computer education to secondary schools. This was as an initial step to introduce more ICT technologies in secondary school education systems. The Institute of Curriculum Development of the Ministry of Education and Culture (MOEC) recommended a syllabus for secondary schools.(Government Order No.2 [15]) and the Ministry of Education adopted the Computer studies syllabus (1996-1997). The Curriculum was revised in 2002 and 2005 and computer studies are already being examined by the National Examination Council of Tanzania (NECTA), but it is implemented in only a few private schools [16]

Tanzania, through MOEC, has formulated a policy to promote the introduction and integration of ICT in pre-primary, primary, secondary, teacher, non-formal and adult education. The educational policy in 2007 covers infrastructure and technical issues, curriculum and content, training and capacity building, planning, procurement and administration, management, support and sustainability and monitoring and evaluation. The ICT policy 2007 for education in Tanzania, defines the term ICT to refer to forms of technology that are used for communication to transmit, store, create, share or exchange information.

This broad definition of ICT includes technologies such as radio, television, video, telephone (both fixed line and mobile), computers which includes hardware and software and their respective networks, as well as the equipment and services associated with these technologies, such as electronic mail, text messaging and radio broadcasts. This has increased motivation in Tanzania to use radio, television, computers, laptops (notebooks), satellite, mobile phones, handheld devices and personal digital assistants (PDA) and other emerging technologies in education [17]. The strategy of implementing the policy starts by first giving priority to teacher's education so as they become future teachers of students. This will make more delay for the majority of schools to start procurement process of ICT equipments.

1. 2 Thesis Structure

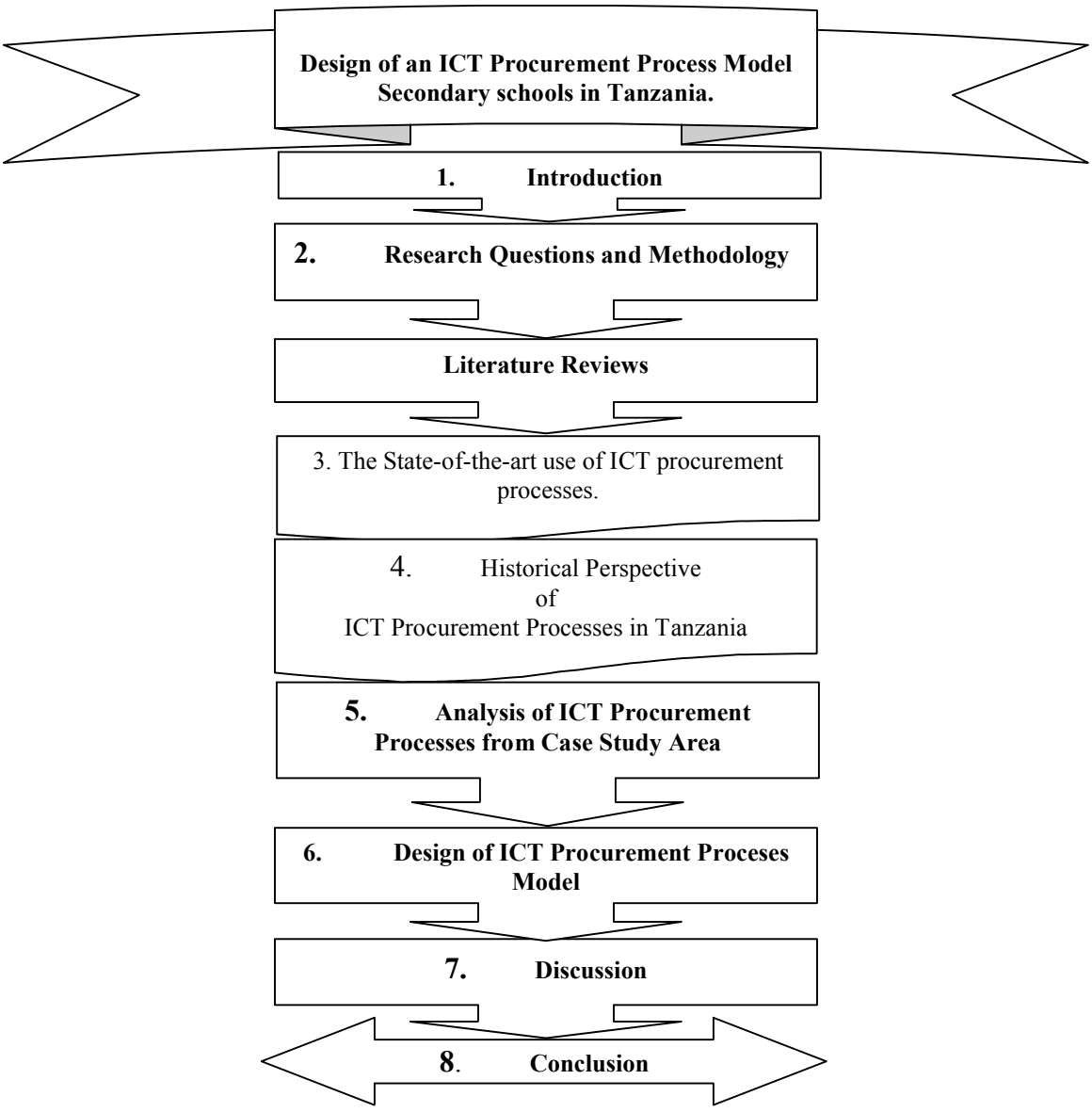

Figure 1: Thesis Structure.

Chapter 2 starts by explaining the importance of research questions, and their outlines. This is followed by explanation of methodology which were used in the research in order to get the answers of the research questions. Then it explains the way a researcher has mixed methodology when collecting primary and secondary data, the design of qualitative and quantitative questionnaires to respondents and the content analysis of the collected data. A reason for doing web usability test to the sampled population is also given. Chapter 3 gives the definition of the main terms, such as state of art, procurement and processes. Then describes a general procurement processes in solicitation, selection and awarding of Tenders. Different tendering processes such as single sourcing, sealed bid, competitive bidding, two step bidding, combinatorial and electronic tendering processes are explained. A short description is given of challenges in procurement processes, includes, transition cost, innovative and knowledge procurement, and how to encourage learning-by-doing in procurement processes is given.

Chapter 4 concerns the historical perspective of ICT procurement in Tanzania, by describing how the Information technologies were acquired from time when the British government was ruling the country and at the time of Tanganyika Broadcasting Corporation as an information instrument. The three stages of ICT situation in Tanzania is described. The first stage when the government procured all ICT equipment using foreign experts who worked under contracts, then a result of what happened when the contracts for foreign expatriates expired in absence of locally trained manpower, reasons for the ban on the importation of ICT equipment in the country which existed for almost 20 years from 1974-1994. The second stage describes the formation of ICT task forces which was responsible in giving advice to the government on ICT procurement. The purpose of this was to avoid repetition of mistakes done in the first stage. The third stage describes different strategies taken by the government on policy issues and trade liberalization, practical approaches, status and challenges in ICT procurement. Chapter 5 gives a description of the respondents to questionnaires. It shows how each question was analyzed, and the way the meaning was derived from the answers to questionnaires, some of the methods used was content analysis by categorization, coding and tabulation according to the main themes emerging from the responses. Then the results of analysis

are represented into in the form of pie charts. Chapter 6 uses the finding from literature reviews and analysis. These were needs requirements for design of the ICT Procurement Process Model. First these requirements are explained to show how they fit into a business model, which resulted into the design of a technical model, which together gives an ICT Procurement Process Model for secondary schools.

Chapter 7 discusses a point by point of the results from the analysis in chapter 5, then it shows how the results of the analysis have answered the research questions presented in chapter 2.

Chapter 8 Conclusion gives a short review of the studies conducted in the thesis, description of outcome and discussions of future works as a result of the study.

2. Research Questions and Methodology.

The importance of the research question is to narrow the research purpose to a specific question that the researcher is attempting to address in the study. Research questions drive the method used and the type of research design, sample size and sampling scheme employed and type of instrument administered and data analysis technique. The questions are interrogative statements which represent purpose of the study which can be formulated based on theories, past research, previous experience or practical needs to make data-driven decisions in a work environment [18].

2.1 Research Questions

ICT procurement processes are used in secondary schools in Tanzania on implementation of computer studies curriculum provided by the Ministry of Education since 1993. But its implementation is only to few schools. What kinds of ICT procurement processes are used in schools in Tanzania for the implementation of computer studies curriculum? When did schools in Dar Es Salaam started the ICT procurement process and what could be the reason for delay in starting the implementation of using computer studies curriculum.

What options and categories of ICT equipment have been practically applicable on procurement processes in schools that have already started to implement the curriculum in secondary schools in Tanzania?,

How does the Public Procurement Act (PPA) affect on ICT procurement process for secondary schools in Tanzania?

Does the Ministry of Education provide any specific guidelines to secondary schools in order to guide schools administrators in making decision on ICT equipment procurement processes ?

What challenges are encountered by secondary schools in the process of ICT procurement in respect of needs assessment to support the improvement of the procurement processes ?

How have schools started using electronic mail for internal and external communication? In case school have website, they could provide contacts person on the website, otherwise individuals e mail can be used for a similar purpose.

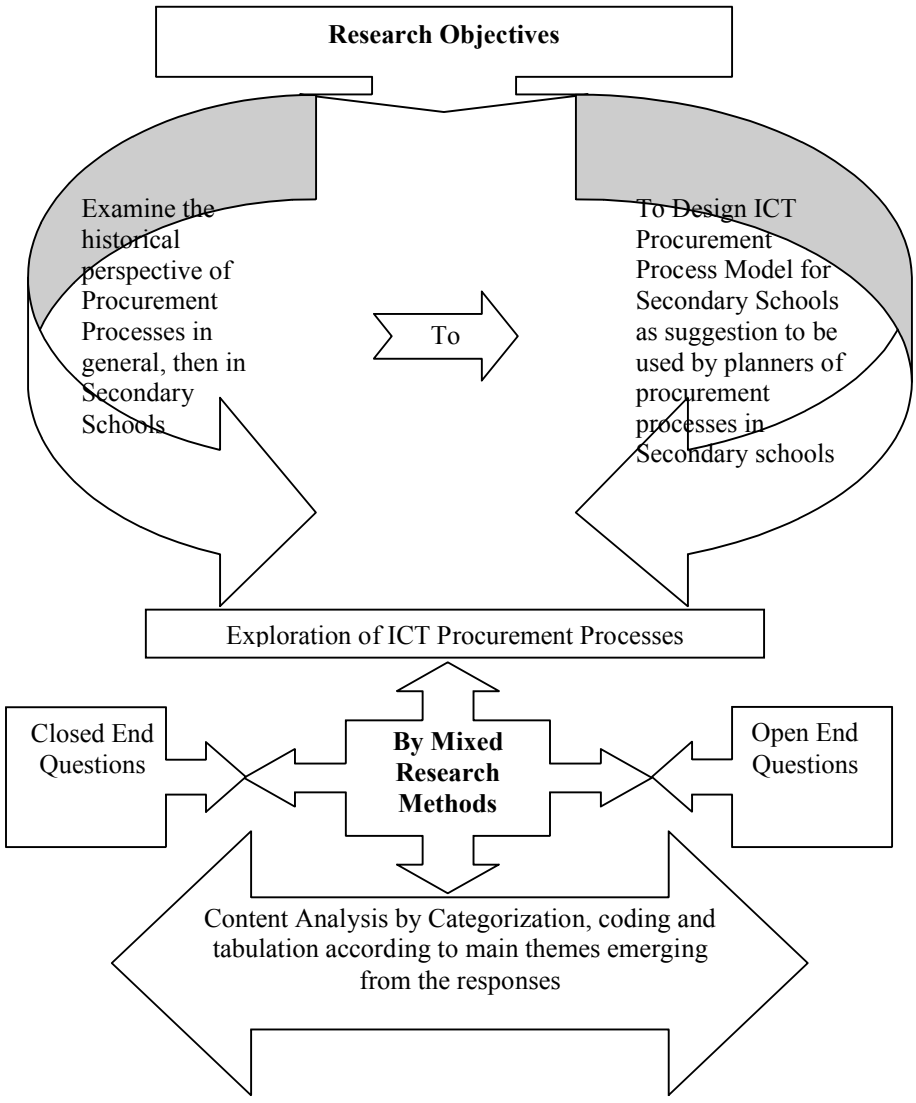

Figure 2: Methodology Structure.

2.2 Methodology

The outcome of the research led to the design of a ICT procurement process model, this indicated an action after research. Then qualitative followed by quantitative questionnaires were used as a tool of survey during data collection and analysis, which indicated a mixed methodology research design [19].

Primary data was collected in the form of self administered questionnaires which are given in Appendix 2. These questionnaires were sent by e-mail to the administrator in Dar Es Salaam, who printed the questionnaires and distributed them to 26 respondents in schools located in Dar Es Salaam. The answers were collected by an administrator and sent to Joensuu Finland by post. Response to questionnaire was 69% and the other 31% were non responsive. From the answers of questionnaires, the author was able to know the types of procurement processes used by schools to implement the computer studies curriculum, and the time when schools started ICT procurement processes. Also the author was able to understand the practical options and categories applied in procuring the ICT equipments. Answers also indicated types of challenges encountered in needs assessment and improvement of procurement processes.

Secondary data was collected by reviewing documents from different sources on procurement processes, Policies guiding ICT development in Tanzania and literatures on major development of ICT in Tanzania helped in getting the base line data on ICT equipment situation in Tanzania. Some of the documents reviewed included Public Procurement Regulatory Authority (PPRA), Procurement Guideline for Secondary Education Development Plan (PGSEDP) 2004-2009, Information & Communication Technology (ICT) Policy for Basic Education (PBE). Internet research for electronic sources was another source of recently published information as these sources are overtaking paper media [20]. From the document review I understood that the PGSEDP is an extract of the PPA, and was prepared in order to suit the needs of procurement processes in the educational environment for secondary schools.

The PGSEDP is a guideline for school administrators in planning and making decision on ICT equipment procurement processes. The PBE indicated challenges encountered by administrators in procurement processes of ICT equipment in secondary schools. Through the internet, I managed to have access of all the documents for review.

Brainstorming and feedback from supervisors during review meetings, was the critical input to the research process and gave more encouragement through professional scrutiny, critique and guidance on proper methodology and standards, while a language reviewer corrected the grammar and structure of the thesis to make it a readable document [21]

Sampling purposefully concentrated on schools which have started implementing computer studies curriculum in Dar Es Salaam. The allowable time frame for survey was within a sustained period of 15th-27th November 2007, as shown in the research permit letter Appendix 2. Responses from questionnaires allowed the author to understand the context of the problem which assisted in coming up with a suggestive model to assist in deciding a practical way to get solution. Content analysis was used to represent the findings from the questionnaires in which completed questionnaires from respondents were examined, categorized, coded and tabulated according to the main themes emerging from the responses. In some cases simple cross tabulations helped to identify response which did not initially make sense [22]. The Google search engine was used to perform a web usability test, to check if respondents had web site and e-mail contact addresses.(refer chapter 6, par 6.1)

3. The State-of-the-art use of ICT procurement processes.

This chapter starts by defining the important terms, then describes general procurement processes, which includes solicitation, selection and award and tendering processes. Finally it gives some challenges in procurement processes and how to learn procurement processes by doing.

3.1 Definition of terms

The use of the term state of the art can be traced back in 1910, when it was used in a Gas Turbine Engineering manual [23] quoted as *'in the present state of the art this is all that can be done?* It is a phrase used to express the level of development as devices, procedure, processes, techniques of science reached at any particular time as a result of modern methods. Explaining the state of the art of procurement process, consideration is given on the way these different technologies and their innovative knowledge can be procured, so as they can be used for education in underserved populations of developing countries.

Procurement which is defined by the Software Engineering Institute (SEI) at Carnegie Mellon, is a set of activities performed as part of an acquisition effort [24]. It involves process of acquiring goods, works and services, covering both acquisitions from third parties and from in-house provides. It starts from the identification of needs to the end of service contract or end of useful life of an asset. Darrel [25] says the term procurement is used to describe the purchase of goods and services which are no directly used in the main business of a company. For example a car manufacturer will procure training courses for employees to attend in order to improve their skills. However, thinking on procurement, other writers argues that, there are two sides, the demand side (i.e. where there are users of products who have needs to procure) and the supply-side which does the production and provision of goods and services to be supplied. The definition of process varies among different researchers [26, 27, 28, 29].

All however, insist on the following three key components of processes a) activities (i.e. events or tasks that is comprised in the process), b) resources (i.e., items that are created by or pass between activities), and c) actors those who execute the process and the resources used and created in the process.

The definition of procurement process is represented in Figure 3 below, it involves solicitation, selection and awarding processes.

3.2 General Procurement Process.

A generic view of procurement processes as given in figure 3 is common, which can be grouped into three main processes of solicitation, selection and awarding. The level of details differs depending on the method used on procurement (e.g. figure 4, for Sealed Bid processes). The level of detail can also depend on the product characteristics to be procured, which can result in a different procurement process. People involved in procurement need to experiment with new methods and techniques of procurement process depending on the level of development of institutions, the market and the well being of a given country [30, 31].

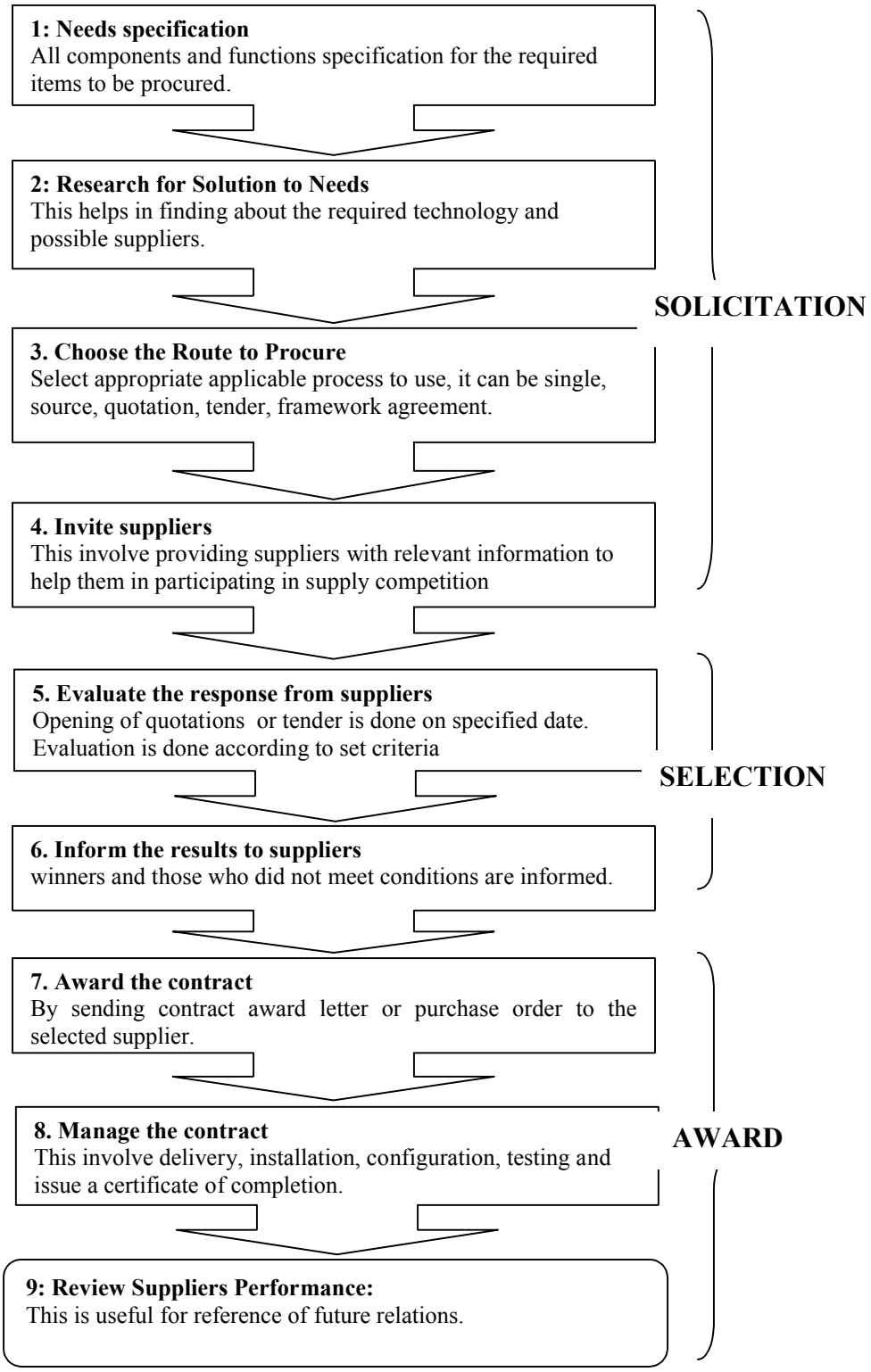

Figure 3. Phases of procurement processes

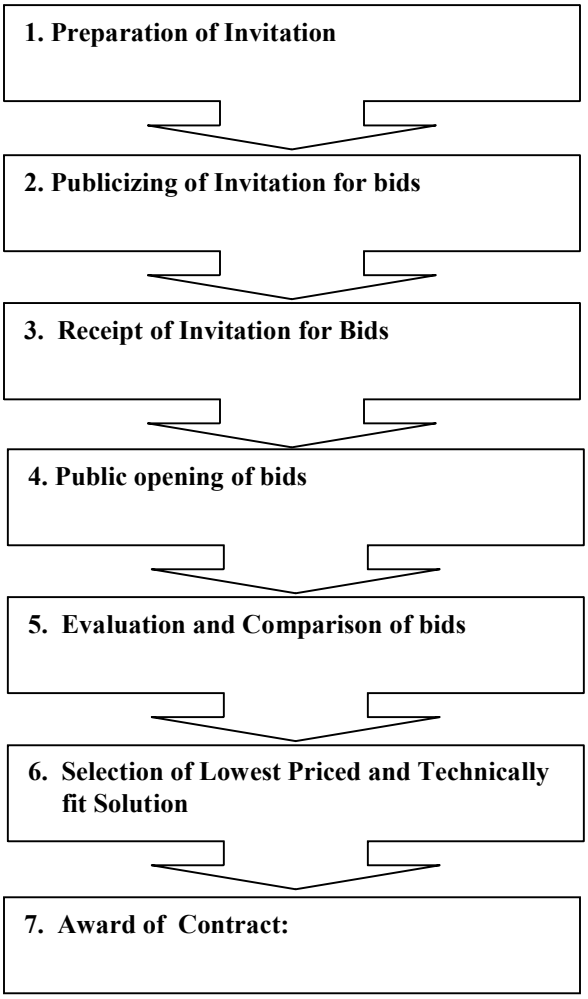

Figure 4. Sealed bidding tendering procurement process

3.2.1 Solicitation process

When a need arises (e.g. of ICT equipment), it triggers the need to specify the product requirement to fulfill the need, administering a market survey to determine the source that can offer the product, choosing the method to procure and inviting suppliers. Specification is based on item performance or need for standardization. Depending on the type and the price of the product required, different methods can be used to procure the equipment, by single sourcing, sealed bid tendering, competitive bidding or combination of the two (two step bidding - refer 3.2.4 for explanation of these terms).

Then inviting suppliers for bidding, which is done through specific rules, but can be through advertising and publicizing in news papers with the broadest readership to maximize competitions or through notices boards in city halls. Otherwise emerging ICT technologies can be used such as home pages on the internet world wide web, bulletin boards or mailing list.

3.2.2 Selection process

The selection of suppliers can involve evaluating the responses from suppliers and informing the results to both winners and those who did not meet conditions to be selected. There are mainly three general steps in evaluation; the first process is examining each bid so as to verify its completeness and responsiveness to mandatory minimum requirements. Then evaluation is done on the responsive bids only, that means those who have met the minimum requirement. Normally the criteria for evaluation are given in the tender documentation, and can focus on price and technical specifications. The winner will be the one who offers best value of money to the procurer, (e.g. maintenance and running costs, environmental considerations, capacity of suppliers etc.) and not necessary the lowest value. The evaluation is done by the evaluation team who are knowledgeable with the type of goods and associated services required, procurement procedures and bid evaluation procedures.

3.2.3 Awarding processes

The awarding process involves the offering and acceptance of a contract. Offer and acceptance is a simple form which is signed by two parties coming into agreement, which becomes an awarding document, according to terms and conditions which are established in the Request for Proposal (RFP). In case there were changes in the RFP terms during discussion and negotiations with bidders, a preliminary notice of award is issued to notify the winner that is selected for award and information is given to them that a contract will follow after. The contract will incorporate the final negotiated terms and conditions which will include all changes which was agreed (e.g. price, specification) in respect to contract [32]. The process of awarding can be single awarding and multiple awarding processes depending on the number of lots which the winner bided.

The last stage in selection is informing all non-responsive bidders that they were not selected, this includes giving them justification on how results were reached. Signing contract allows the delivery, installation, configuring, testing, and issuing a certificate of completion.

3.2.4 Tendering processes

The procurement processes can either be centralized or decentralized. In centralized procurement processes, procurement processes and services is done centrally. This helps in many ways, some of which can be in maintaining technology consistency and standards. It reduces the cost of maintenance and support.

In decentralized procurement, there is a shifting of responsibilities for managing procurement, from central top level to distributed bottom level. In decentralized the responsibilities and authorities are given to local authorities who are near to delivery points. The choice between the two is a strategic issue and challenging for both public and private organizations in procurement [33]. Specific traditional approaches of tendering include the following processes, single sourcing (by quotation), sealed bid (by invitation for bid method), competitive proposal (by request for proposal or competitive negotiation) and two steps bidding (a combination of sealed bidding and competitive proposal). ICT has brought an emerging electronic tendering process and other online (descending) auctions. All these traditional and emerging tendering processes will briefly be described in the following paragraphs [34]. **Single sourcing process.** Refers to a process where a single supplier is selected. As a precaution, during evaluation phase the goods and services need to comply with the specification given in the requisition to purchase. Apart from its positive results such as quick decision, due to shorter procurement processes, it has more probability to influence corruption. This process is mostly used when the purchases are less in value and quantitatively. Some developing countries like Tanzania have legal requirement that at least three quotations need to be collected from pre-qualified suppliers to allow competition.

A sealed bid process is a process which starts by the procurer preparing an invitation in a bid to invite the bidders to submit bids in sealed envelopes.

Then the procurer selects the bidder who has submitted the best bid, i.e. bids with the best value of money, to become the winner of the contract to pay the amount submitted in the bid.

This process is used when a procurer does not need discussion with bidders and there is an assurance that a complete specification is provided to bidders and that there is at least two or more responsible bidders who are willing and able to compete for business. These results to a fixed price procurement process based on price indicated in the bid. Preference to sealed bid tendering process can be argued from the fact that it avoids complex evaluation criteria of repeating evaluation as that of competitive or two step tendering processes explained in the following paragraph. It provides better price to the procurer because by default suppliers tend to be very careful in setting up their prices to maximize the chances of acceptance as they are not sure on the price margin of their competitors. The process also minimizes unethical practice. However, on the other side it requires the procurer to prepare a clear specification of what is needed, otherwise an intelligent successful bidder can use the weakness, or ambiguity in specification to reduce its costs to increase their profit. One disadvantage is that, by bidders tending to put minimum price for fear of competitors to maximize chances of being selected, bidders can opt to select low bid priced equipment and services which has disadvantage to the procurer [35]. **Competitive bidding processes** is a competitive procurement process which starts by the procurer preparing an RFP which is then released to public notice of solicitation. The main objective is promotion of open competition and provide allowance for discussion through a pre-bid or pre-proposal conference, where bidders meet with procurer to discuss technical and cost matters given in the proposal that are not clear. Competitive bidding is preferred when realistic specification may not be available and when contract award amount or cost can only be determined on the basis of negotiation with the bidders. The process has many steps to be followed, hence it needs a reasonable amount of time to complete as shown in Appendix 4. Unlike the sealed bid process, it is used when cost is not the only important factor of evaluation but best value has to come from proposal that is technically acceptable with lowest evaluated price [35]. **Two step-bidding process**. The two step process is a mixed approach of the sealed bid and competitive proposal.

Submission of bids can also be in two steps or single step depending on the policy requirements of the organization executing the process. **For a single step**, the bidder submits to the procurer two offers one for technical and another for price, but the procurer evaluates technical part first while keeping the price part in custody unopened. In the second step, the evaluation of the price offer is done for those bidders whose technical proposal are accepted in step one in order to get the lowest priced bidder. **For two steps**. The technical offers comes first, which are evaluated to check for acceptability. Then bidders whose technical offers are accepted are informed to submit the prices offers, which are also evaluated to get the lowest price bidder. The goal of the two steps bidding processes is technical eligibility first. The two step bidding process takes advantages of both, the sealed bid and competitive bidding processes. Competitive bidding by its process of evaluating the technical offers in a single step submission, which allow discussion to determine the acceptable technical offers in similar way done in competitive bidding. While it resembles sealed bidding, by its process of evaluating the lowest price bidder in a two step submission of bids is similar way explained above. **Combinatorial process.** This is used in case of procurement of multiple supply contracts, located in different geographical locations. The bidder can submit two bids of different items which are located at different places at a time. As an example, Italian procurement agency decided to perform combinatorial tendering for telecommunication services and fresh fruits and vegetables [36, 37]. An example in ICT procurement processes can be when the average cost of serving two adjacent regions is substantially lower than that of serving just one of the two areas, due to the fixed backbone already in place.

3.2.5 Electronic procurement process

ICT development has enabled procurement processes to be done electronically through a web based interface. In this case a procurer sets up a web site. The web site allows participants to submit sealed bid tendering. The supplier can bid for a single item or multiple items (lots) within a specified time through electronic interface. The awards, supply and service contracts can now be done online. The European Union adopted the application of online auctions since 2004 [38].

The United States of America (USA) adopted the e-procurement in mid 1990 and is rapidly spreading through different organizations in the USA [39]. Apart from these developed nations adopting e-procurement, they give different views on using electronic tendering process. On one side it is useful to improve procurement performance, process simplification, quickening of tendering processes, cost savings in case of awarding standardized products, that can be specified and evaluated in terms of price. While on the other side it is difficult to be applied for products and services which have to be evaluated by commission (e.g. the WB is one of the organizations to implement e-procurement solution for selection of consultants). Another institution prefers online tendering process because it reduces barrier of entry. Participants can submit an offer in the absence of their physical presence. However technological tools can be a barrier in case people can not use ICT solutions. Hence despite the development of the technology, still there are some organizations in Europe and America use traditional award-to-tender based processes.

3.3 Challenges in Procurement Processes of ICTs

Various literature highlights the challenges facing the ICT procurement which is caused by the dynamic development in technology. They mention these challenges as transition cost, innovations and knowledge [40, 41, 42, 43].

3.3.1 Transition Costs

It is a reality that due to continuous development of ICT, there is a tendency of merging the duration of use of equipment between the old brand and the new brand. Old brand can be reliable and familiar to users, but new brand can incorporate advanced technologies with attractive features. The features are designed as results of different needs in the society, which increases the frequency of procurement decisions. These frequencies of procurement decisions can lead to a cost of transition from old to new brand, cost is due to new skills, which need to be learned in order to use, operate, service or repair the new equipment, from this opinion, there is a need of dynamic procurement strategies in buying and coping with transition costs [40]

3.3.2 Innovations Procurement

Various authors [41, 42, 43] support the idea that innovations is key source of development in ICTs. Government should act as a major driving force for the development of innovative procurement processes. Policy to procure innovations will enable many researchers spend more time on innovative research hoping to sell the innovative results. Knowledge created by these innovations, once created, can be procured like any other good. On the other side some knowledge can be used by many people simultaneously at almost no cost, e.g. Pythagoras theorem (the same theorem is used by many people without incurring any cost, even though someone might have paid the inventor)

In order to control who has or is using certain innovative knowledge, it needs intellectual property rights or other means of appropriations, because once knowledge is procured it is put into the public domain. Nicola [35] has also argued that government needs to facilitate the publication of research, from public universities and laboratories to the public, by covering the cost of research and granting monetary prizes to innovators. This will enable the created innovative knowledge to be accessed by public more widely.

3.4 Challenges for Procurement Processes in Schools

ICT procurement processes in schools can involve a wide range of stakeholders depending on specific application in which schools needs to procure and use these equipments. Some of these stakeholders can be policy planners, education administrators and other institutions responsible for infrastructure development, for example electricity utility companies for power supply to schools.

- **Policy planning** on the specification of educational goals, provided in the studies curriculums (e.g. computer studies syllabus). This requires an understanding of the available ICT infrastructure and the potential in different contexts for specific applications.

- **Educational administrators** need to merge the ICT equipment priority to their educational needs. Teachers need to have ICT knowledge capacities in respect to best practice available and the way they can be adapted to specific needs.
- **Infrastructure** for ICT procurement is another challenging object, educational technology infrastructure depends on the national telecommunication, information infrastructure, or energy utilities companies. In some cases these infrastructure organizations falls under control of different ministries, hence team work is needed in order to combine the interests of business and service organizations.
- **Schools buildings** needs to have appropriate rooms where ICT equipments can be installed. This might need new rooms or buildings to be constructed and the old building needs to be maintained for proper electrical wiring, ventilation, safety and security.
- **Financing** the cost of procurement and use of ICT need an amount of capital which most developing countries can not afford. Majority of schools are run by the governments as service organizations not for profit making. The challenge is to select a model of implementation that can offset the cost, taking into consideration the scarcity of financial, human and other resources. Whyte [44], suggests some potential sources of money and resources for ICT procurements in schools as grants, public subsidies, private donations, fund raising events, in kind support of equipment, volunteers, community support, revenue earned from core business in schools (phone, fax, internet, web pages), direct computer access to users, office services (photocopying, scanning), also other business services, i.e. word processing, spreadsheets, budget preparation, printing, provision of service for distance education, training courses, community services(meeting rooms, social events), sales of stationary, stamps, and refreshment. These are some of the challenges which could be adapted by stakeholders in schools in developing countries like Tanzania.

3.5 Learning by Doing, Knowing Doing Gap in Procurement Processes

Normally people learn to do new things and the gained knowledge is transformed into action because when the idea is widely known and proven to be useful and valid, if it is not implemented, it is difficult for other people to realize the usefulness. There are growing number of research findings around the world but the translation of these research findings into practice is slow. This is the reason that various authors support the idea of adopting learning-by-doing procurement processes [45, 46, 47, 48, 49,50]. **Learning by doing** refers to the capability of workers to improve their productivity by regularly repeating the same type of action. Research findings shows that knowledge that is actually implemented is more likely acquired from learning by doing than learning by reading, listening of even thinking, as taking action is likely to generate experience from which one can learn**.** The speed of change of technology available in the market is growing so fast. People involved with procurement in schools needs to experiment different procurement processes so as to learn new skills and gain experience by doing practically. **The Knowing Doing Gap** is important because, there are already many organizations which have created and disseminated knowledge in different formats such as books, articles, and consultancy or training programs. Jeffrey and Sutton's [51] research in organizations found that performance depends largely on implementing what is already known, rather than from previously unknown ways of doing things. These concepts of learning by doing can be applied even to Procurement Processes of ICT equipments, in order to increase more access to technologies for schools in developing countries. It is a fact that developing countries like Tanzania are importers of ICT technologies. People involved with procurement needs to know what has already been created and available globally in the market, so as to understand the gaps and then try to proceed from what is already known and has not been implemented. This will require to have suitable procurement processes to fit the fast pace of change of ICT.

4. Historical Perspective of ICT Procurement Process in Tanzania

As indicated on the subject of the chapter, it gives historical perspective of ICT procurement in Tanzania. Three main stages are described which gives a distinctive situation which has caused impact on ICT procurement process in Tanzania. The first stage is preceded by a brief explanation of the situation before independence. The second stage was during the ban of importation of ICT equipment into the country, and the last stage was a period after removal of the ban of ICT importation.

4.1 First Stage 1961-1974

A decade before independence in 1951, the British who were ruling Tanzania under the Mandatory rule, introduced a broadcasting experiment service using an old ex-army transmitter to serve Dar Es Salaam Region [52]. Resulting from this more studios continued be built, and in 1955 the broadcasting network expanded through-out the country. This was later followed by the establishment of Tanganyika Broadcasting Corporation (TBC) in 1956. [53]. This was the beginning of radio transmission technology for mass broadcasting in Tanzania which later was adopted for training in primary and secondary schools.

The independence of Tanganyika from the British Mandatory rule was in December 1961, and the United Republic of Tanzania was established in 1964 after unification of two independent states of Tanganyika and Zanzibar [54]. The new government recognized that radio was the only form of communication technology that was more effective to reach the people of Tanzania. Hence in March 1965, the Parliament passed a bill that placed broadcasting directly under the control of the government [55] and the name of Tanganyika Broadcasting Corporation changed to Radio Tanzania Dar Es Salaam (RTD) and by then its main functions were information, education and entertainment [56]. In this view it is obvious that the government of Tanzania inherited the procured communication technologies from the British colonial rule.

Changes were made to fit the requirement of the country at that time and the main focus was to educate the people on effective ways of eradicating illiteracy, poverty and disease, and the role of the school service from RTD was to supplement the work of teachers in formal education and socialization of the young [57].

In 1967 the government of Tanzania formed a blue print for developing socialism, the Arusha Declaration, which resulted into all mass media communication to be rationalized. Hence radio communication as one of the main ICT tool that existed at that time, became a main strategy of communication for developing educational programs and socialism [58]. Up to 1977, Radio communication was concluded to be an effective educational media for reaching people more quickly even into villages than any other form of communication [59]. This led the Tanzania Information Service (TIS) to plan and provide radio set to Ujamaa villages as part of a five year development plan starting late in the 1960s.

The evolution of transmission of electronic information in Tanzania is tied to its membership to the then East Africa African Community with Uganda and Kenya that dates backs in 1927. The two co-operations led to the establishment of the East African High Commission 1948-1961 that were followed by the foundation of East African Common Services Organizations from 1961-1967 and finally led to formation of East African Community (EAC). These community corporations had common telecommunication infrastructure. The EAC halted in 1977 due to conflicting and distinct political systems in the three countries, (socialism in Tanzania, capitalism in Kenya and dictatorship in Uganda). Then each country had inherited some of the equipment and infrastructure from EAC, which enabled the start of similar industries to cater for nationwide interests. In 1978 Tanzania established the Tanzania Post and Telecommunications Corporation (TPTC) that originated from the then East African Post and Telecommunication Administration (EAP & TC). At that time, there were not local trained personnel in many fields including those related to ICT. The government depended on foreign expatriates who were working in these inherited organizations.

These expatriates were employed to work on temporary contractual terms to maintain computers and develop software which were required by different organizations in the government. The procurement of hardware (mainframes) was through centralized processes in which the Government's Ministry of finance-computer service department was responsible for ICT requirement procurement in the public sector. No consideration was given at that time for policy making or overall coordination on the use of ICT in the country. The mainframe computers were very expensive hence procurement was only made by institutions which could afford the cost [60].

In 1972 the government introduced a decentralization policy which shifted decision to regional level, this created problems in the design of software. Each region/district came up with its own coding system and software design. It was difficult to integrate nation-wide and the share of information was troublesome as there were no consistencies between designs. This resulted in the Ministry of Finance's failure to computerize the accounting system for the country and most of information systems developed could not be of use any more. At the same time the contracts of expatriates ended, technology kept on changing and ultimately computers became obsolete, because there were no guidelines in terms of policy, standards, institutional frameworks for needs analysis, capacity planning, procurement processes, installation and human capital development. This was the time the government resolved to go back to manual systems, so as to get more prepared for computerization and banned the procurement of all ICT equipment into the country in 1974 and formulated a guideline for the evaluation of requests for import/procurement of computer equipments [61].

Some of the contents of the guidelines were:

- To justify an in-house mainframe installation, the applicant needed to have an extensive experience with computer applications and comprehensive technical manpower base, supported by management team knowledge in the application of computer technology.
- To justify an in-house mini computer, the applicant needed to have extensive experience on electrical/electronic accounting machines and a thorough understanding of computer technology.

- Any application of external experts could only be considered if the available local capacity could not satisfy the applicant's available resources in time-hire basis, in order to conserve resources.

4.2 Second stage –Ban of ICT importation - 1974-1994

During the ban the government formed two independent teams to study the effectiveness of information, communication, technologies in the country [62]. The first team consisted of consultants from the National Institute of Productivity (NIP) and International Labor Organization (ILO). The task of the first team was to advise government on formulation of a National Policy on Computer Technology (acquisition and utilization) and National Training Programme in Computer Technology.

The formation of first team by the government was the initial motivation of creating different policy strategies, briefly explained in the following paragraphs. In 1985, the Ministry of Planning and Economic Affairs established the National Science and Technology Policy for Tanzania, the objective was to establish an appropriate legal framework laws, regulations and rules for rationalizing, assessing, monitoring and controlling the choice and importation of technology to make sure that only relevant technologies are promoted and imported**.** The liberalization policy of 1986 covered all aspect of businesses in the country including ICT, which included mass media institutions for radio broadcasting, news agency and information services [63, 64]. In 1987, there was a seminar on the contribution of ICT to Economic Development which was held in Arusha. The meeting proposed the formation of a task force on Informatics to examine the complexities of ICT. The task force was given a responsibility to recommend to the Government of Tanzania, the necessary policy formulation and strategies relating to ICT. The task force suggested the government to review restrictions on the acquisition/procurement and importation of ICT equipments in the country so as to facilitate access to technology [65]. In 1990, the Ministry of Science Technology and Higher Education (MSTHE) was established. One of its objectives related to ICT was to control and co-ordinate the science and technology sector within the Ministry and in all the institutions dealing with development of science and technology [66]. At that time, various institutions had already started conducting training in ICT in higher learning institutions.

This was presented in a report by Sheya, who traced National ICT training plan since 1973. The report indicates that Training on ICT needed to include procurement processes and utilization of technology, but the findings showed still these institutions lacked financial capability for sustainability. Another development was in 1990, when the government deregulated Mass Media Services policy which resulted in the formation of television stations. At this stage various private institutions were given licenses to provide television services, these institutions are, Independent Television (ITV), Cable Television News (CTN), Dar Es Salam Television News (DTV) [67]. The second team was called Government Computer Task Force. Members of this second team came from Government computer service practitioners. Its main functions was to report on computer utilization in existing manpower base, through out the country and consider all ICT procurement applications, in order to advise the Ministry of Finance if to grant/or refuse permit for procurement/acquisition of ICT equipment.

Members of this team was appointed by the Ministry of Finance, and they were from government institutions and organizations such as Bank of Tanzania (BOT), University of Dar Es Salaam (UDSM), Tanzania Electric Supply Company (TANESCO), National Bank of Commerce(NBC), and members from the Treasury department of the Ministry of Finance (MoF). Computers procured and utilized in government institutions at this time were mainly mainframes, because personal computers were procured through donor funded projects.

4.3 Third Stage -After removal of the Ban from 1994-2007

The main focus of the third stage was to try to solve some problems experienced in the first two stages. At the time there was a lack of overall policy and poor harmonization of initiative, which led to random adoption of different systems and standards. These resulted in unnecessary duplication of efforts and waste of scarce resources especially the loss of potential of working together to produce a combined effect. The Government decided to formulate the National ICT policy. The vision statement is to enable Tanzania become a hub of ICT infrastructure and ICT solutions. To enhance sustainable socio-economic development and accelerated poverty reduction, both nationally and globally. While the mission is to enhance nation-wide economic growth and social progress.

Encouraging of beneficial ICT activities in all sectors through a conducive framework for investments. Capacity building and promotion of multi layered co-operation and knowledge sharing locally as well as globally. Various initiatives were taken after that including those related to performance improvement, policies, regulatory and institutional frameworks and National ICTs initiatives and ICT policy in education by the MoEVT [68].

In order to improve performance in telecommunication systems, the communication Act of 1993 was formulated. This made possible the split of TPTC into three separate institutions namely the Tanzania Post Corporation (TPC) for postal services, the Tanzania Telecommunication Company Limited (TTCL) for communication services, and the Tanzania Communication Commission (TCC) for regulatory services. In 1994, TCC granted TTCL a license to provide telecommunication services. Likewise TTCL started granting license to mobile operators companies such as Mobitel (which is jointly owned by TP & TC and Millicom International) in 1994 and TRITEL (now defunct) in 1995.

Then tax on importation of computer and peripherals was removed in July 2000 [69]. The resolution was passed in order to increase accessibility of ICT equipments into the society.

In 2003 The Tanzania Communication Regulatory Authority (TCRA) Act of 2003 was passed by the parliament. This resulted into a merger of TCC and Tanzania Broadcasting Commission (TBC) to form Tanzania Communication Regulatory Authority (TCRA) a single regulator [70]. Some of objectives of TCRA are; Licensing and enforcing license condition of broadcasting, postal services and telecommunication operations, establishing standards for regulated goods and services, managing Radio Frequency Spectrum and Monitoring the implementation of ICT applications.

The formation of TCRA facilitated provision of licenses to procure into Tanzania ICT equipment in many categories such as network facilities (e.g. towers, fibre optic, microwaves link) network services (e.g. mobile or fixed line services), application service providers (e.g. ISPs, private, public data operator), content processors (e.g. television, Radio).

4.4 ICT Procurement Processes For Education in Tanzanian

The trend to establish ICT in Education in Tanzania started in 1960s when radio was used to broadcast lessons to students in schools (par 1.1 chapter 1). Then in the 1990s the Ministry of Education set a computer curriculum for secondary schools. This was followed by policy formulation to allow television stations in Tanzania (par 4.2, chapter 4). In 2002, the Ministry of Education conducted a stakeholder's workshop to identify and formulate ICT-supported projects that will enhance learning and teaching processes in primary and secondary schools education in Tanzania. The workshop was supported by The International Institute for Communication Development (IICD) of Netherlands and was convened at Bagamoyo.

Procurement of computers for schools and provision of training and maintenance services was one of the concrete projects identified and supported by IICD [71]. The objective of the project was to make ICT equipment available to many users in schools at a cheap cost. In order to fulfill this objective the following steps were used; identification of suppliers, preparing the logistics, developing links with outside contact and development partners, training craftsmen and technicians who will assemble and service ICT equipment, make available cost effective ICT equipment throughout the education sector and ensure that equipments are well maintained and serviced by skilled personnel at reasonable cost.

These initiatives of the Ministry of Education continued and resulted in the establishment of a policy specific basic education in 2007. The vision of the policy is to have a 'A well educated and learning knowledge society' and the mission is to integrate ICT to enhance access, equality, quality and relevance. This covers pre-primary, primary, secondary, teacher education as well as non-formal and adult education. Apart from this policy, ICT based education is also covered in other documents that governs education sector in Tanzania, such as the Primary Education and Development Plan (PEDP) 2002-2006 and Secondary Education Development Plan (SEDP) 2004-2009. They both prioritize introduction of computer courses into primary and secondary education systems [72,73]. Through the educational sector development program, the Ministry of education provided procurement guideline for secondary education development plan 2004-2009.

4.4.1 Procurement Guideline for Secondary Education Development Plan-PGSEDP

There are six groups of procurement processes provided by the in the PGSEDP to be used when on procurement planning and implementation for secondary schools. These are; competitive tendering, restricted tendering, local shopping, direct contracting, procurement of commodity, and force account. These processes can all be applied in procurement of ICT equipment for secondary schools, except the procurement of commodity, which is specifically used when procuring food products, hence is not of interest to this study and will not be described; otherwise a brief description of all other procurement methods is given in the following paragraphs [74]. In **competitive tendering process**, the schools send invitation to prospective suppliers by informing them through a tender notice. This notice is advertised in the local news papers and public meeting places. The aim of this method is to give chances to all local suppliers, contractors and service providers in the region to participate. It gives chances for schools to have more options of selection. The option to use this method is determined by the value of works, goods or services. In case this value is not economic and efficient option, then the other methods described below are used. **Restricted tendering,** is done by sending invitation to tender to pre-qualified suppliers. The pre-qualification is normally done annually in respect to the budget plan year. Hence, this method restricts participation of new entrants in between the period, before the time for the next budget. Why the provision of this procurement process is given, is that some goods can be so specialized and available only to restricted suppliers, another reason can be that the cost and time required might not be enough to evaluate a big number suppliers who might be interested in tendering. **Local shopping** is common and convenient procurement process, as it is used by schools to procure goods which are available in the market and of small value. The process involves inviting prospective suppliers to submit quotations for the goods specified in the requisition to purchase. Then the prospective suppliers are given a minimum of five days to prepare their quotations, then they submits quotations, which are evaluated and only three economical suppliers who are approved by the school procurement committee becomes a list of pre-qualified suppliers for local shopping.

The use of **direct contracting** depends on estimated cost. It is used when works, goods and services are available from one supplier, contractor or service provider. The work, good or services needs to be required in an emergency case that time of delivery is short and the need could not be planned in advance. This can be a result of pressure from external environment such as change of standards, which in case of ICT can be necessary to satisfy compatibility to existing equipments, however the school board need to approve the direct contracting. Lastly the **force account** is used by schools to procure works, that are small, scattered and remotely located, that it becomes difficult for qualified contractors to tender at an economical price, work could not be planned in advance and needs urgent solution, and it should not disturb operational activities.

4.4.2 Procurement Process Approval levels.

The PGSEDP is derived from the Tanzania Government Procurement Act (PPA) No 3 of 2001. It is intended to be used by Secondary schools on a decentralized perspective. It can be used during procurement of goods, works and services when the value amount does not Tanzanian Shillings (Tshs) 30000k (see Figure 5). (I Euro = 1850 Tanzanian Shilings).

There are three approval decision levels in a decentralized procurement systems where schools can decide on what to procure, depending on the budget limit amount. In the first level of procurement of works, goods and services, the Head of School(HoS) authorizes procurement when the value amount is not greater than Tshs, 200k 100k and 50k respectively, while in the second level the School Procurement Committee (SPC) limits are 1800k, 500k and 250k and the last decision level in schools is done by the School Board (SB) in this case, when the procurement value amount does not exceed 30000, 10000k and 5000 respectively. When the amount is above the limit for school board to decide, then the decision becomes over the resolution of the Secondary Education Development Procurement guideline, hence it is centrally done by the regional tender board (RTB) or the Ministry Tender Board (MTB), and this is the case when the Government Public Procurement Act 3 of 2001 is applicable. The approval decision level is shown in the Procurement Approval Process diagram in Figure 5.

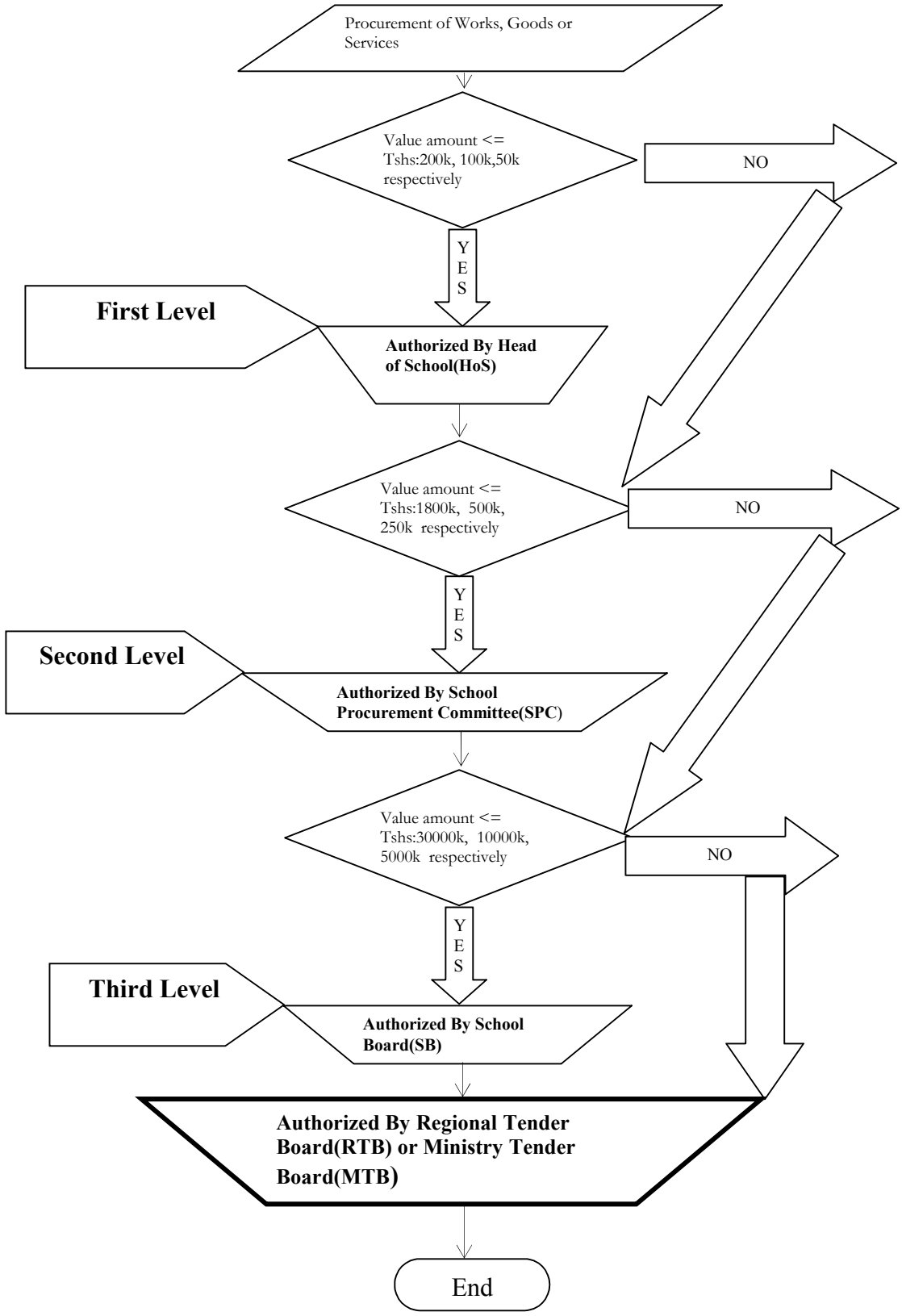

Figure 5: Procurement Process Approval level

4.4.3 Status of Computer Acquisition in Tanzanian Schools until 2007.

Until December 2007, the country depended on imported ICTs due to lack of local manufacturing companies of PCs. Studies on available PCs in the market indicated four main tiers, starting with Dell and HP which dominated in the market followed by IBM/Lenovo, Fujitsi/Siemens and Toshiba. Micronics company limited is a local agent for IBM and HP [75]. Then comes Acer, Mercer, Sahara and Benq in the second tier. The third tier comprises of locally assembled clone imported computers. The company dealing with assembling is Orchards Computer Limited and Mitsumi Company Limited. The last tier caters for second hand used computer of different makes from various part of the world depending on who brings them in the country. New computers were expensive for many schools to afford. On the other side Tanzania still experienced a shortage of skilled ICT experts, particularly software engineers. Professor Beda from the University of Dar Es Salaam, commented that in many IT cadres, if you could advertise for 20 positions, you only got 5 qualified applicants[76]. Some of the companies which have developed software are University of Dar Es Salam, a system for human resource, payroll and planning for local government**.** CATS Limited has developed 'customized accounting system for Tanzania financial requirements [77].

4.4.4 The specific Challenges of ICT Procurement Processes in Tanzanian schools

ICT policy for basic education in Tanzania has already foreseen challenges for implementing basic ICT procurement in basic education [17]. Some of these challenges are:-

- Lack of awareness of wide range of ICTs application which includes those emerging from convergence of technologies.
- Static organizational structures, which are difficult to change to cope with the dynamic environment of change of technologies. This causes delay in decision making.
- Insufficient funds to support a sustainable integration of ICT in all educational levels.
- Inadequate infrastructure such as electricity and telecommunications networks which are backbone structures to support ICT.

This includes a low bandwidth to support wireless technologies (such as Very Small Aperture Terminal (VSAT)) which could be a solution, are expensive for schools to afford.

- Inadequate training and capacity development for teachers which can result in under utilization of procured ICT facilities. However training for teachers in all 32 teachers colleges had started to equip them with knowledge in using different ICT technologies which can help them understand the technical, curricular, administrative, financial and social dimensions of ICT use in education.
- Lack of availability of PCs for people to enable them make use of ICT. When available they are too expensive for many people to afford. The Government stopped import duties and taxes on computer and other ICT equipment, but still economically a sizeable population lives on less than a dollar a day, hence it is unrealistic for many people to invest on equipment worth two years of their income[78, 79,80]

5. Analysis of ICTs Procurement Processes in Secondary Schools in Dar Es Salaam

The purpose of the analysis was to cross check actual data given to answers of questionnaires from respondents, with the aim to building up information to solve the problems in the research questions of the study. Questionnaires were sent to 26 schools in which 18, responded and the other 8 did not respond. The sampled schools are randomly distributed in the three districts of Dar Es Salaam, which are Ilala, Temeke and Kinondoni and their percentage of distribution are 45%, 33%, and 22% respectively as shown in Figure 6, which gives percentage of respondents by district. Please refer to Appendix 2 for a list of questionnaires.

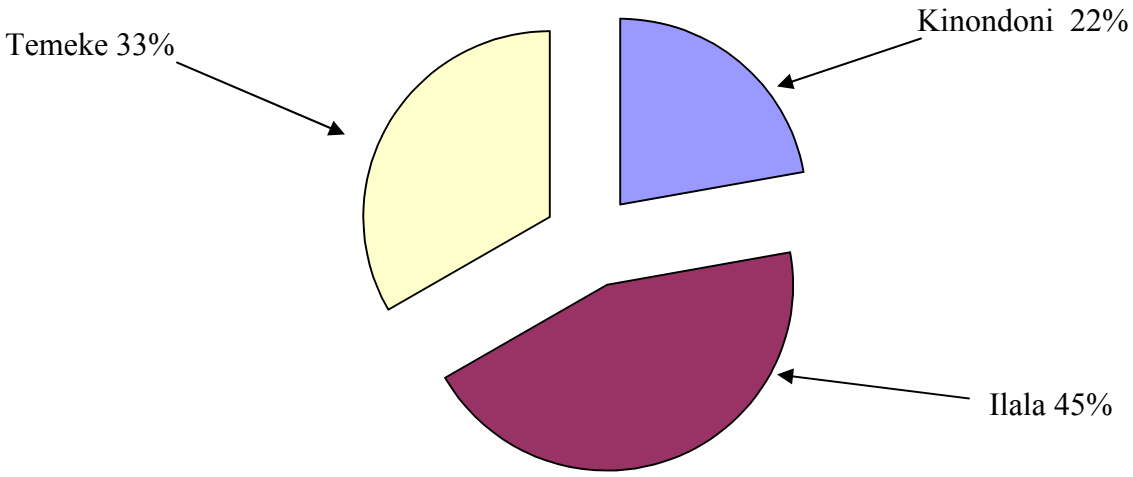

Figure 6: Respondents by District

Among the respondent's schools, Private schools were 56% and the remaining 44% were Government owned schools, this is shown in the pie chart Figure 7, showing the percentage of respondents by category below.

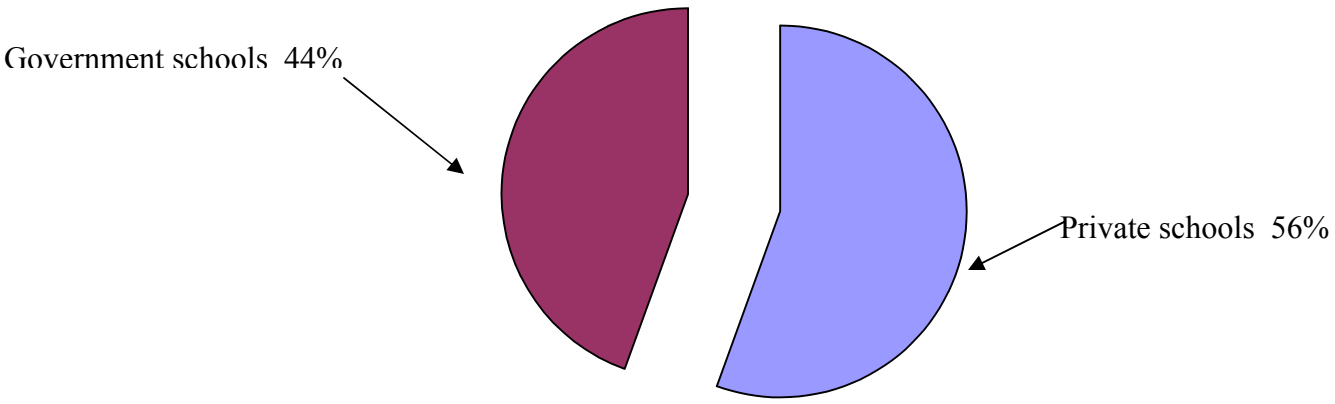

Figure 7: Respondents by category

As already mentioned in chapter two on research methods, the mixed method approach was used in this research, 13 open ended questions for desciptive data were integrated with two structured closed end questions for numerical data collection. Answers from respondents were coded with numbers from I to 18 in descending orders of year in which they started to use ICT in their schools. Then the questionnaires were transcribed and their respective answers are the result of this chapter. Contents were checked for completeness and consistency. Few of the answers were blank, incomplete or out of targeted theme. By inference certain questions were related to each other, hence it was possible to find answers of some of the questions from each other. Content analysis from the respondents was done in order to identify different themes by inferring key words in the context in respect to the domain.

5.1 Data Analysis

Process of procuring the right ICT resource for schools can be complex because a great deal of information is required, starting from specifying the needs and what the school wants to achieve in the curriculum, discovering what technology is available in the market and at an affordable price and finding reliable sources then ordering and managing contract with the suppliers. Hence the procurement process needs a logical sequence of steps, which can be followed to enable responsible people identify key considerations and successfully resolve associated issues(*refer Chapter 4.4 four procurement processes for secondary schools in Tanzania)*

Analysis on steps that are followed in school on procurement of ICT equipment?

On answering this question, 55% of respondents indicated that they are using local shopping, while answers from 6% of the respondents indicated knowledge of competitive tendering. From Chapter 4.4, local shopping is used when the procurements are in small quantities and in case, time is not enough for evaluating bids from prospected suppliers. 17% of respondents indicated that they receive ICT equipments by donation from different organizations (by inheritance), hence they don't have practice of their own. Response from the rest of 22% indicated that they do not have any knowledge of procurement processes.

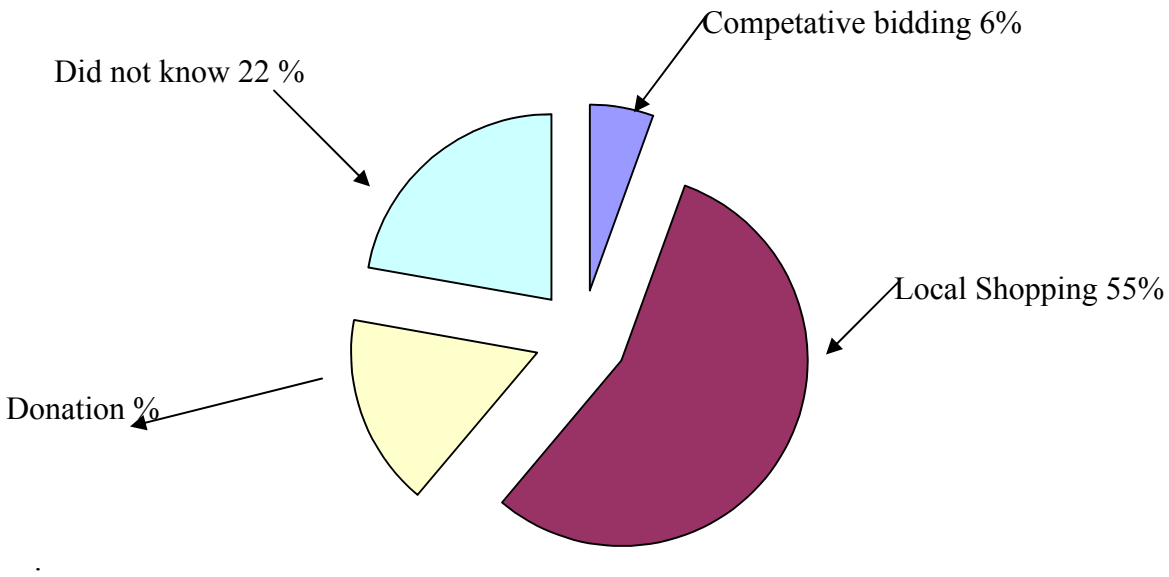

Figure 8: Procurement Process followed by schools

Analysis of time which school started using ICT equipment?

Chapter 1 indicated that computer studies curriculum in Tanzania was set in 1993 and revised in 2005. Hence two groups were derived for respondent's entrance in starting using ICT equipments, the first between 1990-2000 and the second 2000-2006.

Results in Figure 9 indicates that 80% percent of respondents came from private schools and the other 40% from governmental schools. This indicate that, private schools were the first to start implementing the computer studies curriculum.

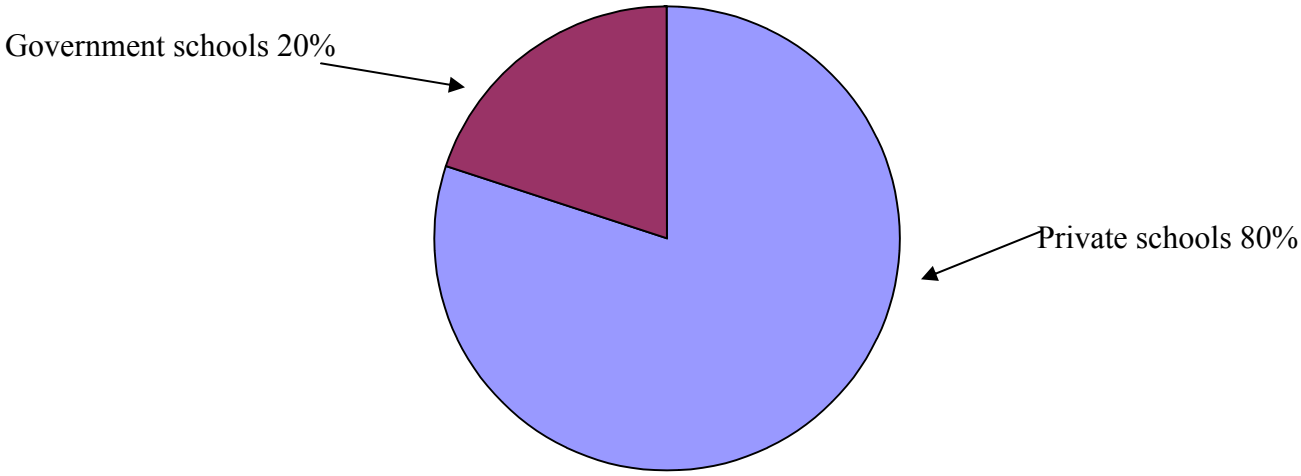

Figure 9: Entrance to use ICT in schools 1990-2000

While between 2000-2005, the percentage of government schools was 54% and the other 46% percent was from private schools. This indicates that more awareness had grown about using ICT equipments in schools that governments schools started to adopt.

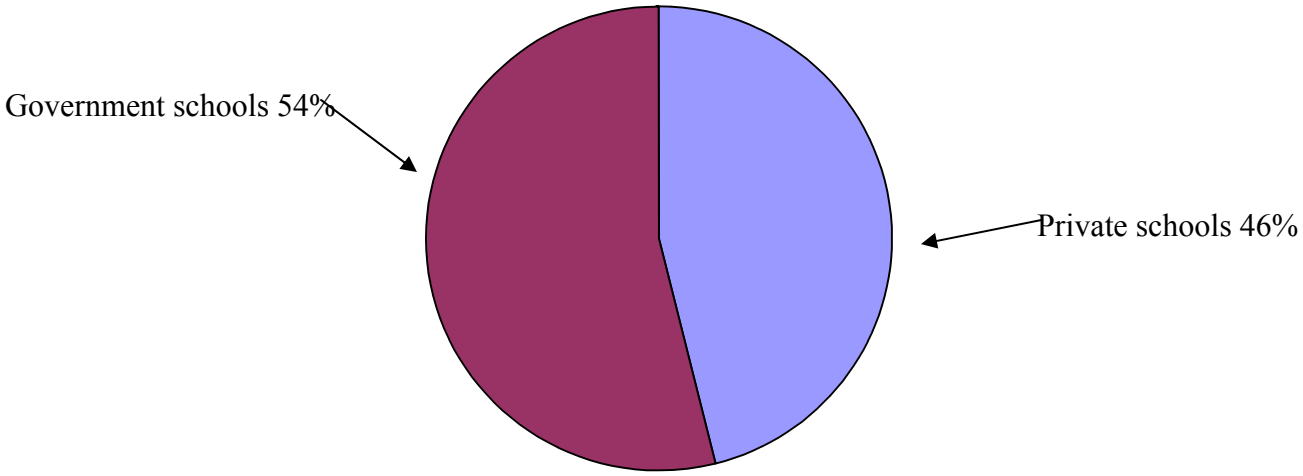

Figure 10: Entrance to use ICT in schools 2000-2006

Analysis of awareness of availability of procurement process guideline

The aim of this questionnaire was to check if schools administrators knew about the availability of PGSEDP, guidelines to support the procurement process, this guideline was prepared by the Ministry of Education. Another aim was to check if schools had separate guidelines, then it was expected that respondents could be able to give the names of the guidelines. Hence responses to questionnaire 3, 4, and 5 were integrated together in the analysis, a matrix of the three questions and respondent were drawn and then the cells were filled with Y for Yes and N for No, in order to indicate if they had any procurement guideline, either from the Ministry of education or separate guideline for individual schools. 26% of the respondents indicated that they have and are using a guideline from the Ministry of Education, while the other 11% indicated that they have their individual separate guideline set by their schools.

The remaining majority 63% did not have any of the guideline either private or the one set by the Ministry of education.

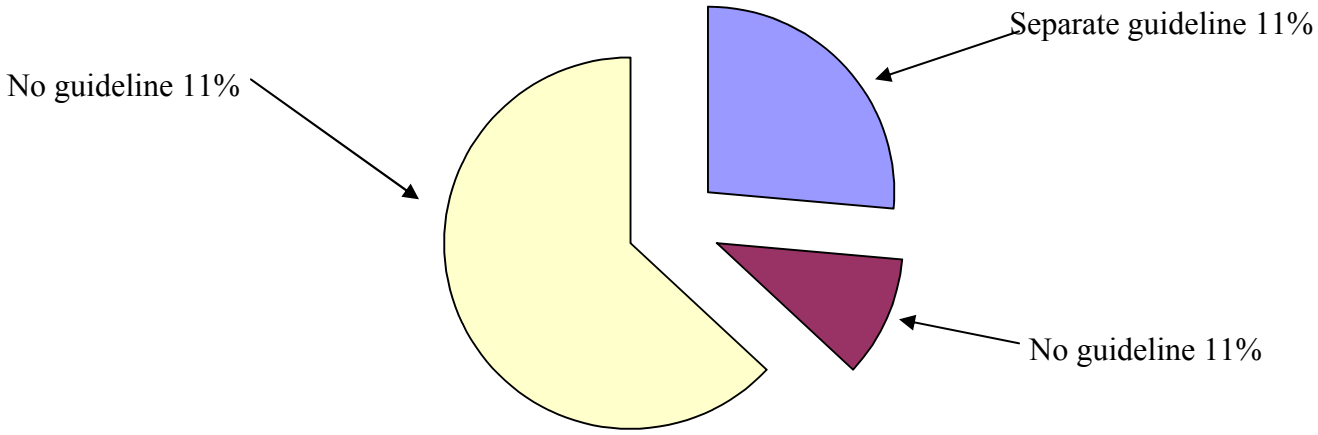

Figure 11: Knowledge of ICT Procurement guideline in schools

Analysis of people responsible with procurement process of ICT equipment in your school ?

Various people have been found to be involved in procurement process of ICT equipment in secondary schools. Five main categories were derived, the major category using a teamwork approach (46%) in which procurement decision being involves , stores manager, bursar, in charge of computers, store keeper, procurement officer, ICT teacher, Head Teacher and students themselves. This was followed by a second category with 18% in which Procurement /Supplies officer was involved.

The remaining three categories all with 12% each, were those in which either only Head of School, Head of Computer and Donation from external organizations(figure 12).

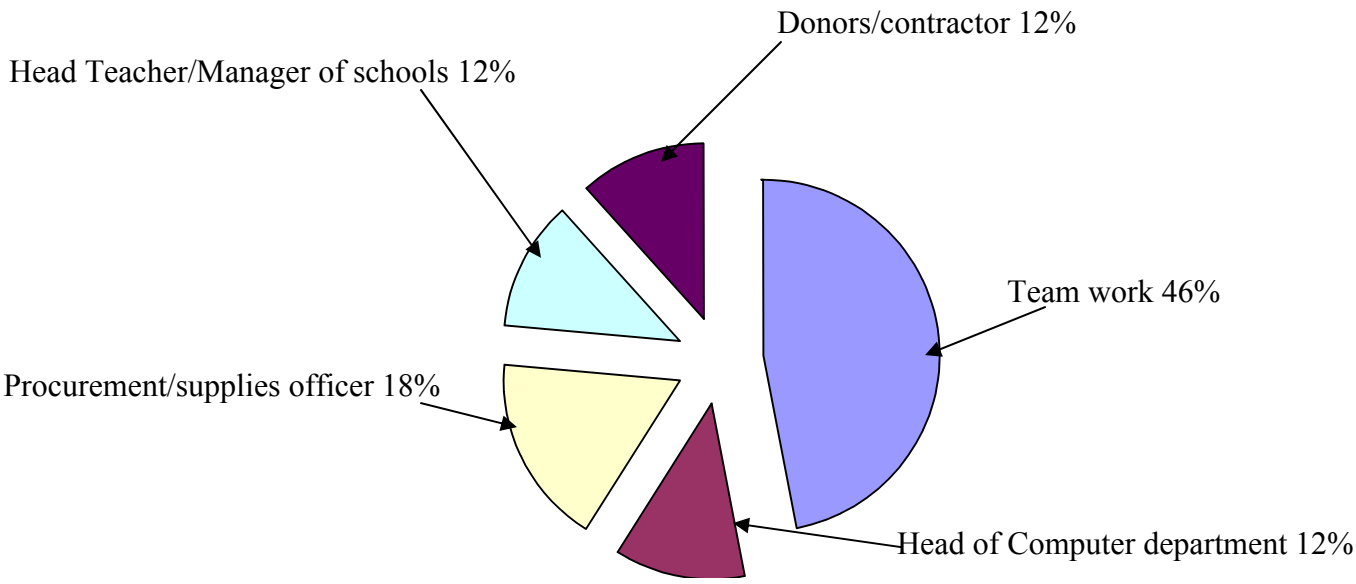

Figure 12: People responsible with Procurement Process of ICT

Analysis of the way schools match their specific needs of ICT equipment with those available in the market?

About matching the needs or ICT equipment in schools and those available in the market, four main category of answers were derived from the respondents. 46% of respondents indicated that it saw the influence of vendors who sells these ICT equipments(vendor driven), in the sense that the decision on what ICT specification fits the needs of their application in schools, depended on the guidance given by those who were selling these equipments. The other 24% indicated having difficult to decide, while 18% made their decision according to what they wanted to achieve from the computer curriculum.

Then 12% indicated that they depended on the donor who was donating computers to school to decide for them.

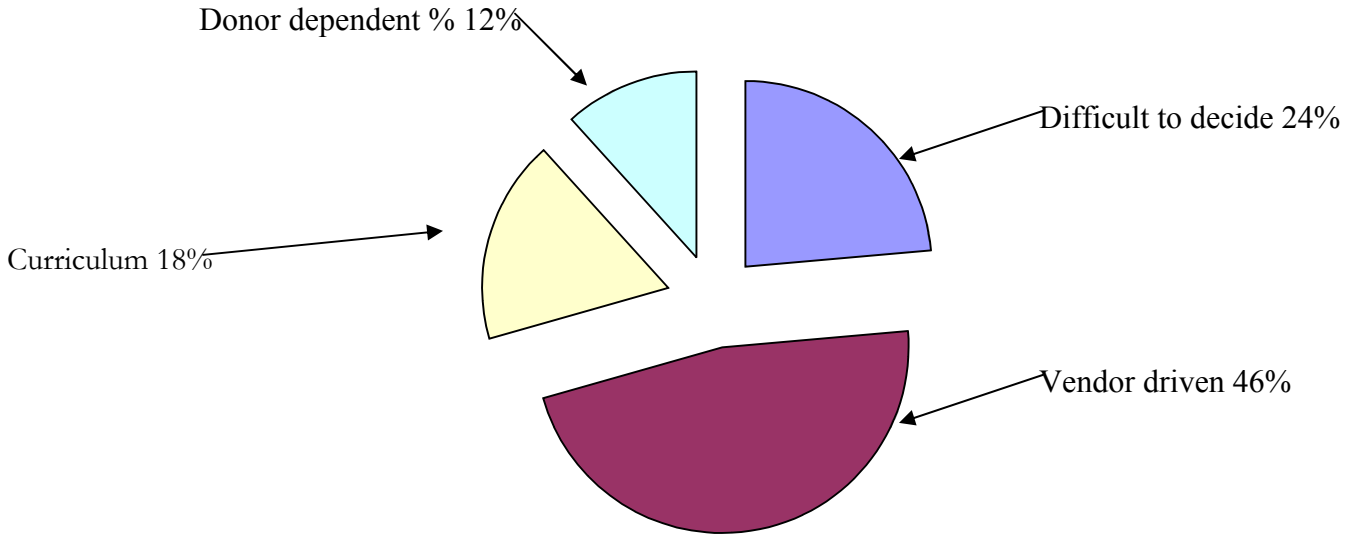

Figure 13: Matching needs to available ICT equipment in the market

Analysis of the ways schools decided on the type of ICT equipment to procure for their schools.

Answers to another similar questions which asked the type of guideline used in deciding type of ICT equipment to buy indicated additional categories of Change of Technology 17%, Ministry guidelines 11% and ICT need in the schools 17%.

All are presented in the pie chart Figure 14, which depicts what guides in matching the needs to available equipments in the market and what guides in deciding ICT equipments to buy.

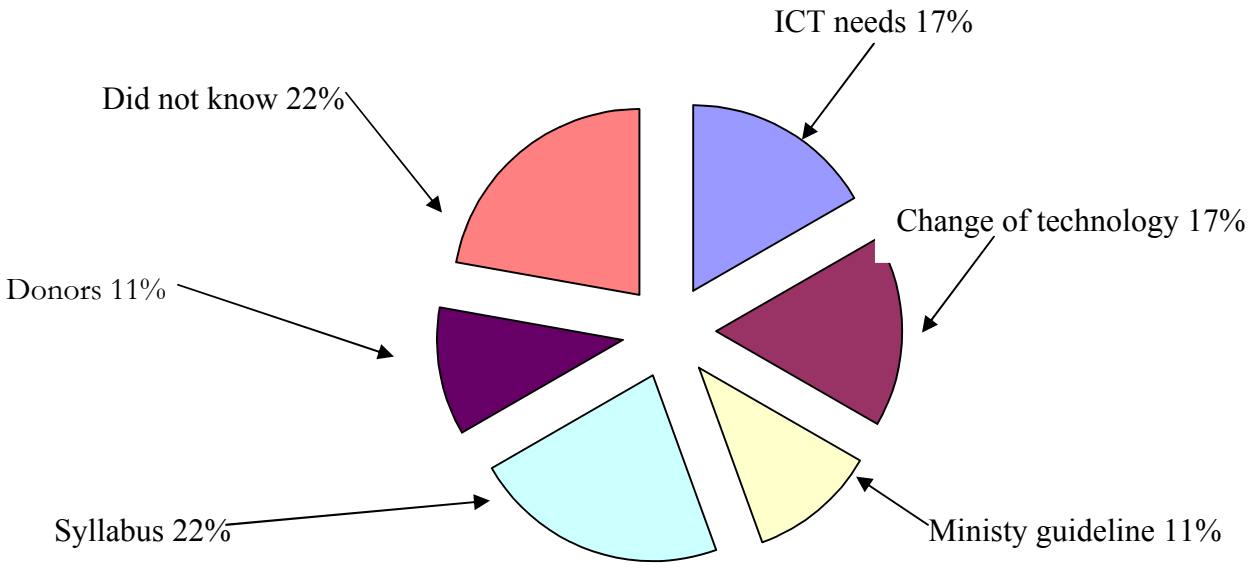

Figure 14: What guides in deciding ICT equipment to Buy

Analysis on the methods which school procured ICT equipment, were done from the following categories

a) Outright purchase from the vendor
b) Leasing then purchase
c) Donation from different organizations
d) Others Please list

Three main methods were used as category to ask schools on the strategies used when they want to procure ICT equipments in their schools. These are leasing then purchasing, outright purchase from vendors and donation from different organizations. The schools were divided between Government and Private owned schools. For the case of Government schools, 75% indicated to depend on donation strategy and only 25% indicated to prefer outright purchase strategy.

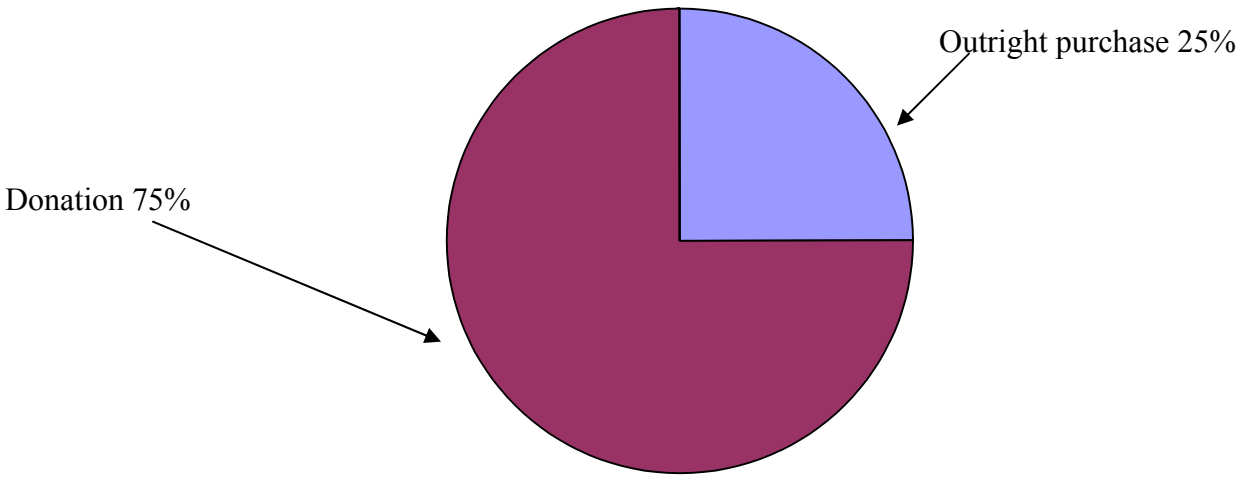

Figure 15: Government school category

While for the case of Private schools, 67% indicated preference on outright purchase, 22% on donation and the rest 11% on the Leasing then purchase option, the results of both two options are shown in the pie chart below. There was no school which indicated the Leasing then purchasing option.

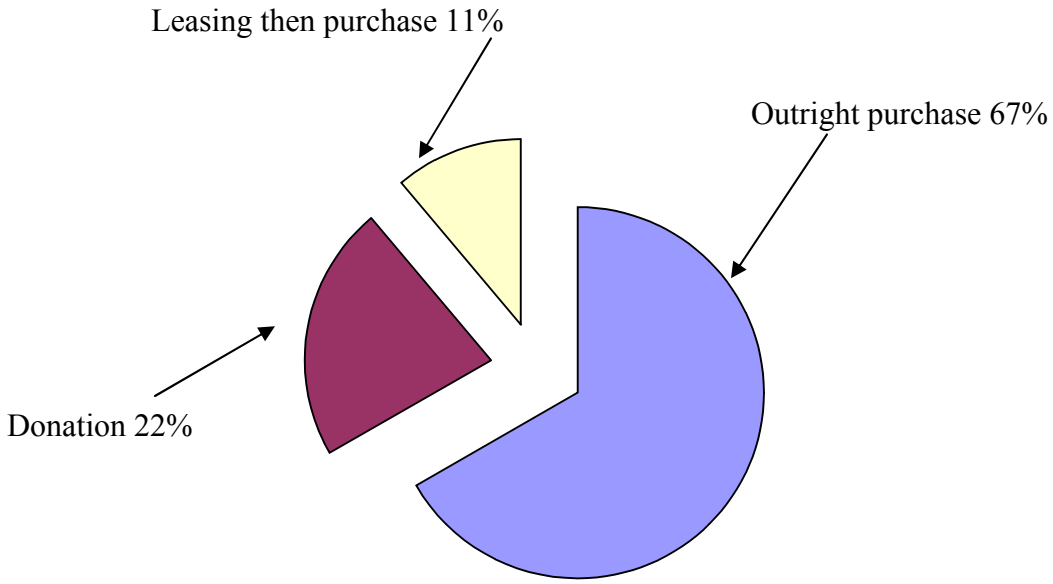

Figure 16: Private school category

Analysis of types ICT equipment preferred by schools when planning for the procurement processes given the following categories.

a) using second-hand equipment,
b) using refurbished second-hand equipment,
c) using new equipment.

Then three other categories were used to ask schools on the type of technology they are using in procurement process of ICT equipments, using new computer, using refurbished second hand computers and using second hand equipments. In the case of Government schools, 50% of respondents indicated preference on using new equipments and the other 50% on using second hand equipments, there were no school among the government category which indicated to prefer using the refurbished second hand equipments.

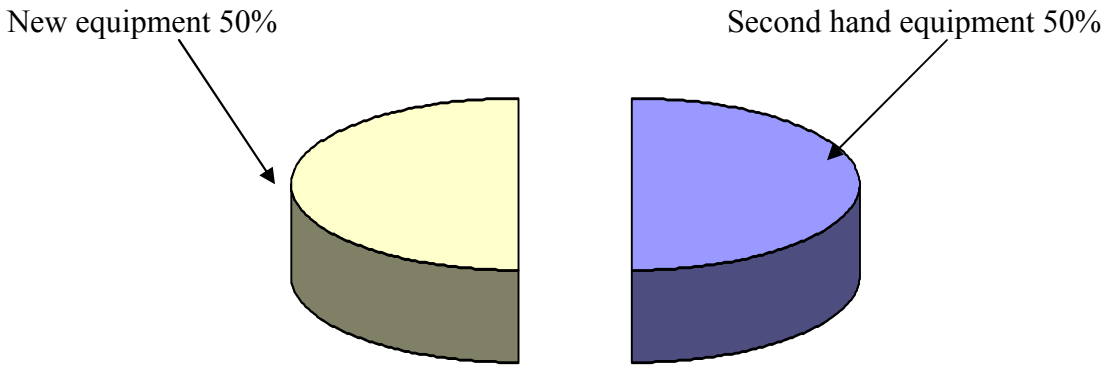

Figure 17: Government category

While in the case of Private owned schools, 34% of the responded indicated to prefer using second hand equipment and 33%, on using new equipments while the other 33% on refurbished second hand equipments.

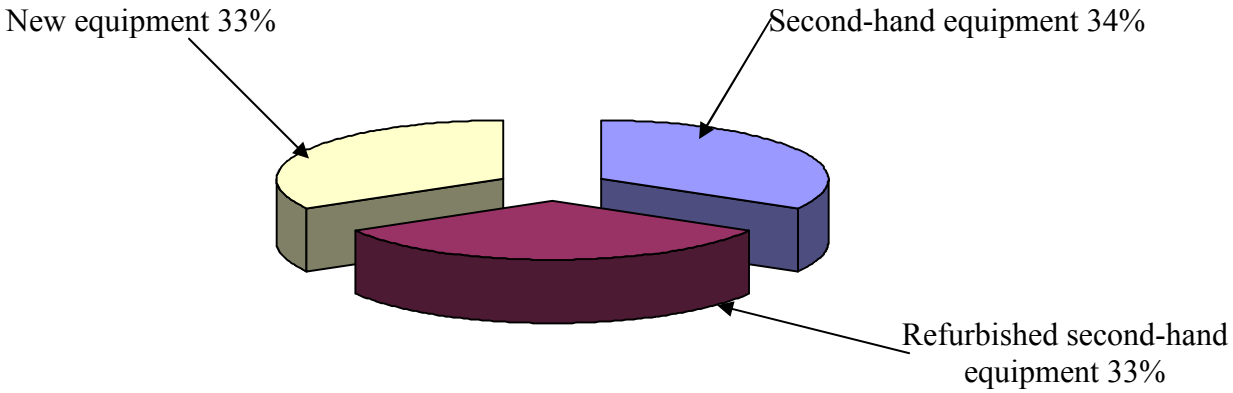

Figure 18: Private category

Analysis of a kind of assistance to help schools in the procurement process of ICT equipment?

The purpose of this question was to know kinds of assistance which schools needed on procurement processes. Five main themes were derived from the content analyzed. Then 28 % percent indicated the needs for Training on Procurement Processes; another 27% indicated a need for financial assistance. Two of the themes with 17% indicated a need of knowledge on appropriate ICT equipment needed for use in schools and a need for more donations of these ICT equipments.

The other 11% indicated a need to have a separate vendor to supply ICT equipments to schools. The results are displayed in figure 19.

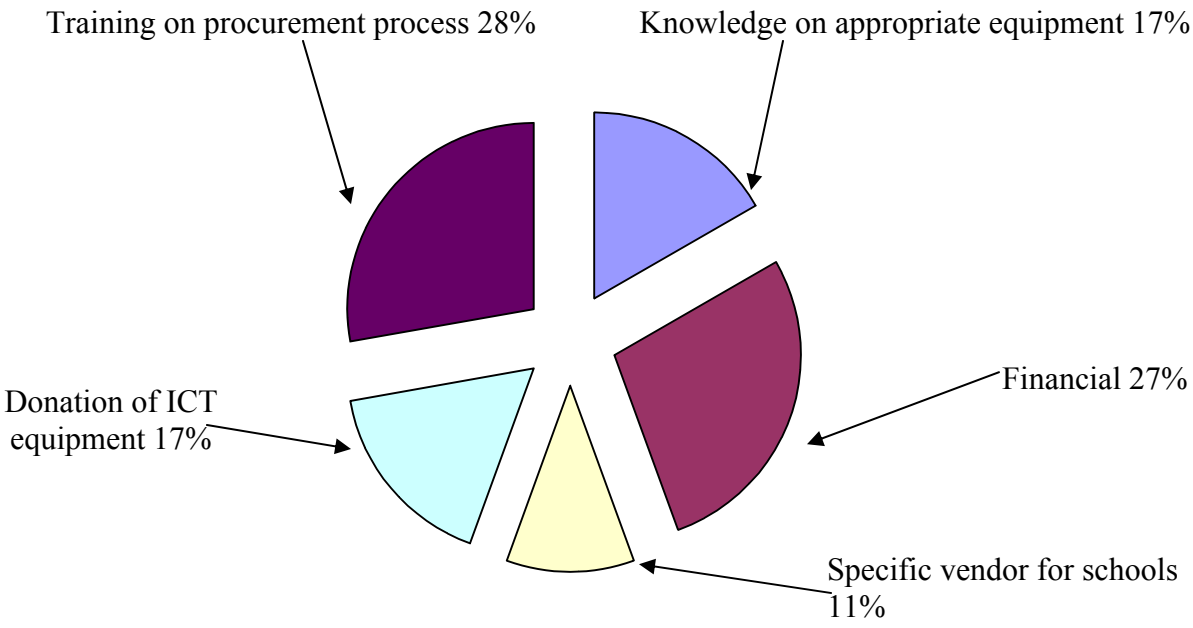

Figure 19: Assistance required by schools in procurement

Analysis of different views to improve the procurement process in schools.

Various ways to improve procurement process was indicated by respondents when they were answering a question, to give proposal on ways which they fond could improve the procurement processes in their schools. Six main ways were suggested, with two of them having the same score of 22% . These suggested training and the need for special vendor to supply ICT equipment to schools. Then 17% of respondents indicated a need for schools to adhere to the guidelines provided by the Ministry of Education on ICT procurements, the other 17% had no comments.

The other two ways with 11% indicated a suggestion to have updated ICT curriculum and budget for ICT procurements.

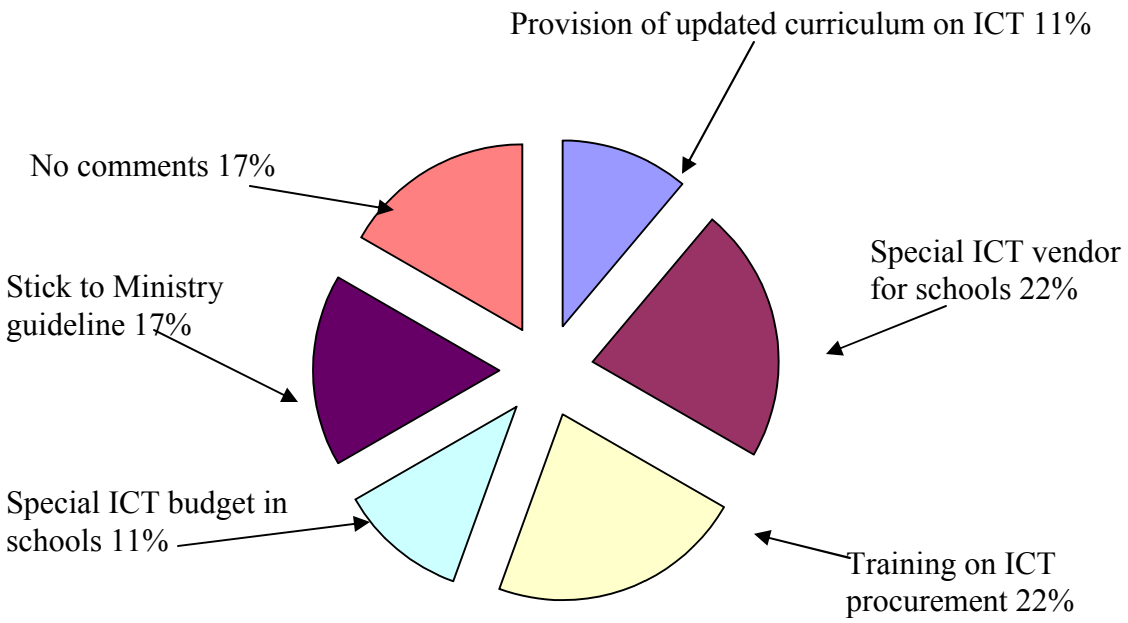

Figure 20: Ways to improve procurement processes

Analysis of the challenges faced by schools in ICT procurement process?

As shown in previous chapters procurement of ICT equipments is a challenging process, asking respondents to tell about these challenges, answers from questionnaires indicated four main challenges

- How to compare Price Vs Quality,
- Lack of knowledge,
- Cost of ownership and
- Lack of funds.

Lack of knowledge was indicated to be the biggest challenge with 41%, which was followed by lack of funds with 29% and the cost of ownership 18%, while the last challenge was how to compare price against quality 12%.

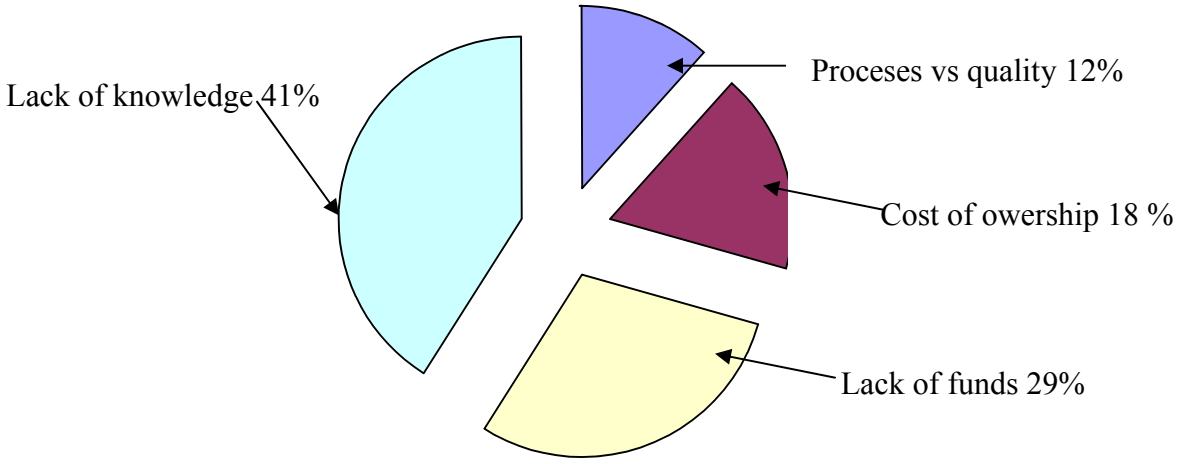

Figure 21: Challenges in procurement processes

6. Design of ICT Procurement Process Model

The concept for designing a model in this case have been adapted from the procurement approval levels in Figure 5. In chapter 3, we have learned that the structure used for procurement process is school systems is decentralized. The new model will use the same structure of communication, for interaction through the e mails, in the process of communicating with different ICT equipment suppliers for schools.

The main purpose of designing a model to enable interaction through e-mail, to increase the networks of people assisting in searching for off-the-shelf technologies, which can add access of ICTs for schools. Bob Metcalfe Law in [81], stated that the value of a network is proportional to the square of the number of nodes in the network. In this sense by adding procurement nodes from Districts, and Regional Educational offices, the schools gets more chances to have access to more ICT equipments. Then the analysis in chapter 5 have given the requirement which were used to select the Business and Technical system options as explained below.

6.1 Business System Option

The analysis in chapter 5 has indicated the requirements needed by the systems to enable an e-procurement process. Literature review in chapter 1 on the e-adoption model Figure 22, suggested the first two initial steps important to this discussion, the e-mail stage, when people within the organization are mature enough to use e-mail for efficient internal and external communications and the website stage, when organization have created their website to place their organization in the world wide market, and have access to worldwide suppliers. For practical purposes the author opted to conduct an online test of web site availability and usability for secondary schools in Dar Es Salaam. This helped the author to check the readiness of schools to use electronic procurement processes. The test was done to validate; if schools have websites, e-mails contact information and if they can be accessed using these contact information. Google search engine were used to ask *'web site for secondary schools in Dar Es Salaam.*

One in 18 schools resulted to have a web site, e mail contact address (the actual test results can be provided on request, as permission were not sought from the owner of the website), then e mail were sent using contact information given on the website, results indicated that 5% of respondent had a website and was able to use e-mail contact addresses given in their website. Referring to an e-adoption model Figure 22, this indicates that 95% of schools are not yet ready to adopt the e-procurement. Hence the need to have a ICT technical solution for stage one of knowing and being mature in using e-mail, for internal and external communication.

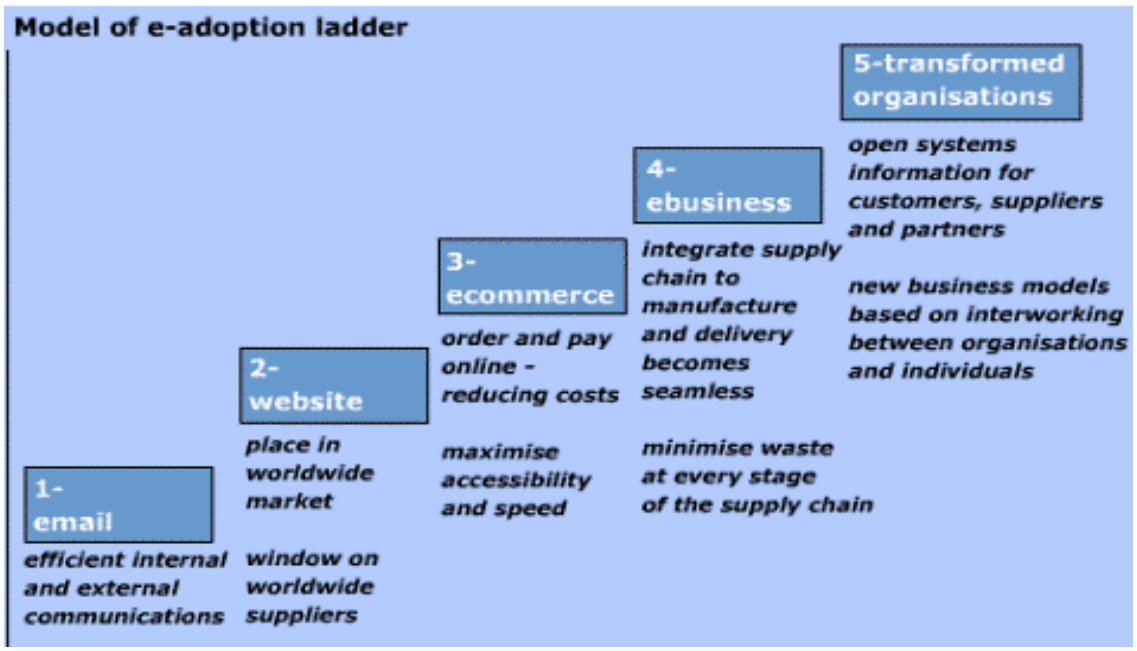

Figure 22: Model of e-adoption ladder. Adapted from Cisco led Information Age Partnership study on e commerce in small business.

On the other side results on figure 15 shows that 75% of Government schools depends on donated ICT equipment, and figure 17 shows that 50% of Government secondary schools are using refurbished second hand equipment and 67% of private secondary schools are using second hand and refurbished ICT equipment. The literature review in chapter 3, indicates that when thinking about the provision of ICTs, we need to consider demand and supply side. Cawthera[15] suggests that provision of ICT for schools in developing nations can be through: *using second-hand, using refurbished second hand and using new equipments*.

This finding has shown that second hand and refurbished second hand computer are the common categories which was used in this case of study. The review on challenges faced by schools indicates that, new computer are still expensive for schools to afford. In this view more ICT technologies need to be in place to increase procurement process, by communication online with suppliers of information on the available ICT equipments. These findings resulted into a proposal of a 'Three Levels -Two Options Procurement Process Model Figure 23, as a business option for secondary schools organizations in Tanzania at the time of authoring this thesis.

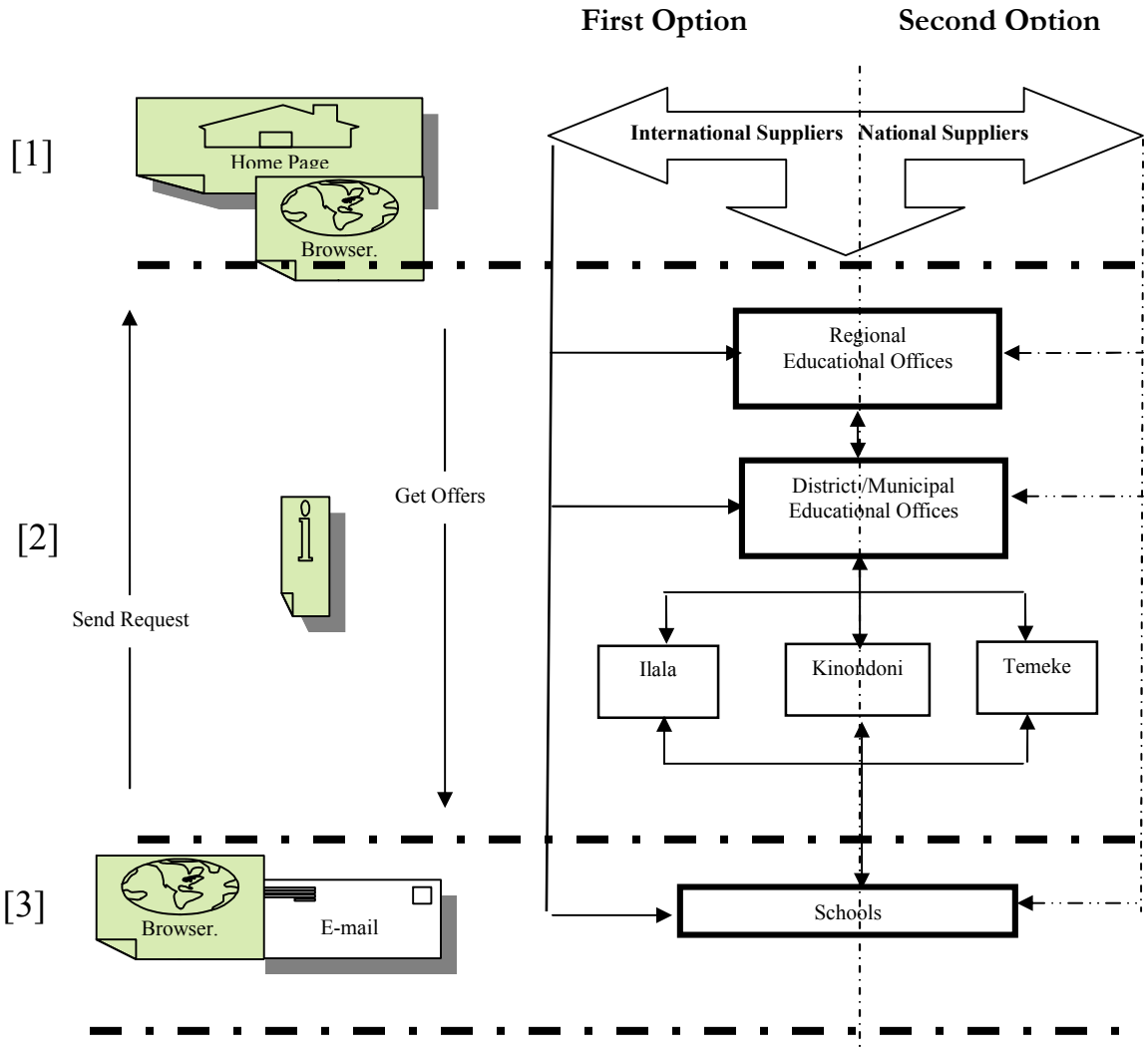

Figure 23: Proposed Three Levels -Two Options ICT Procurement Process Model

6.1.1 Three Levels Two Options Procurement Process Model.

In the first option, international organizations who are current distributors/suppliers of the different types of ICT equipment, broadcast information on their offerings in their home pages. Organizations which need to request this ICT equipment interact with distributors by e-mail and the system allows a person who request an offer to request a specific ICT equipment for training. The requesting people can be from regional, district or directly from individual school.

The distribution can be in a top down approach or individually to the three specific levels. In the second option, it is expected that due to speed of change of technologies and user needs in organizations, the national organization will also starts to distribute their second hand equipment to schools also in a top down approach or individually to specific levels as in the first tier. The above traditional structure can be translated into a technical architecture shown in figure 24.

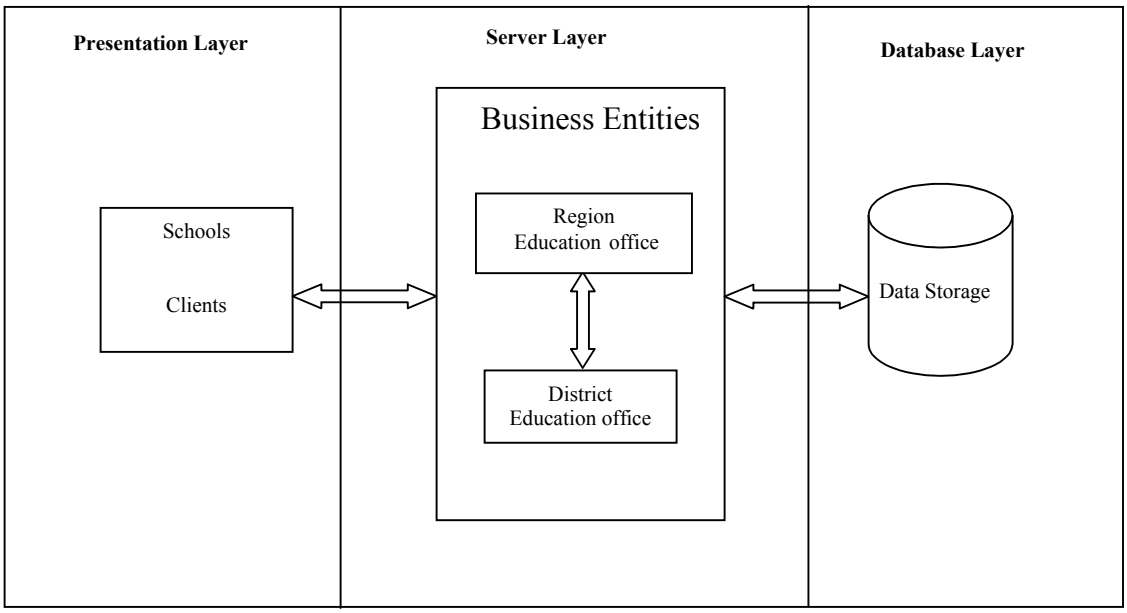

Figure 24: Proposed Three Tier ICT Procurement Model Architecture

6.1.2 Proposed Three Tier ICT Procurement Model Architecture

The three tier architecture consists of a presentation layer, server layer and a database layer. The presentation layer display pages and present to schools the data on ICT equipment available for procurement. The server layer contains the business entities, (regional and district educational offices) where educational planners(actors) resides. The educational planners will be searching and processing information about the available ICT equipments in the world wide web and matching them to applications requests from schools, or linking requirements from schools to lists of suppliers. The business entities will enable the maintenance of lists of viable suppliers, hence separate schools from the difficulties of maintaining the supplier lists integrity.

The actors in business entities act as procurement officers for schools. Each time a request is made, the Business application server will communicate with the Data base layer to provide the required information.

6.1.3 Purpose of the system

The purpose of the Web-based procurement system (WBC) is to allow interaction through the internet, between people who offer computers (Offers/Suppliers) and those who request computers (Request/Receivers). It can be used by people responsible for procuring computers for training, i.e. in secondary schools. It identifies the people that offer computers as distributors and requires that they have an account, while the people in search of computers have free access.

6.2 Technical System Option

The design was implemented through the IT project. The Ruby on Rails framework (Para. 6.2.3) was used for developing the system. The Rails framework has a model which handles what‘s called an object-relational mapping layer entitled *Active Record*. This layer allows you to present the data from database rows as objects and embellish these data objects with business logic methods which make changing the system easy. The frame work is an open source software technology, hence it cheaper to widen the product and maximize the potential of choice. By many people having learned to use internet through communication by e mail, it will be easier to adapt to and interact with systems. In this view within 30 minutes the user will be able to access the system, view the offers and details of computer description and make decision on the type of offer to select. With the previous knowledge of the users gained by using the internet, Web-based procurement system can be user friendly to the community using the existing internet systems.

6.2.1 Essential features

The services provided by the system to meet the needs of the users are of two categories of offers and request of these computers. The system allows the contact person offering computers to login to the systems to see his/hers offers. The system shows the list of offers through offers listing and the respective details of computers through the 'view computer button'. It allows the offers and computer descriptions to be edited. New computers can be added to offers created earlier. Then the system allows the user to delete the offer and computer description after it has been offered.

6.2. Hardware requirements

Server computer with at least 1500 MHz processor with fast network connection. The client computer will be a common workstation computer with not less than 512 MB of ram and at least 20 GB Hard disk capacity. The capacity of the hard drive is that big in order to accommodate the installation of an operating system, of a web server and a database server. The client workstation needs to have a keyboard, mouse and color monitor.

6.2.3 Software requirement

The Ruby on Rails which is an open web framework has been used. Rails works with a wealth of web servers and databases. It needs modern operating system with Ruby interpreter installed. In this case WEBrick has been used for Web servers, MySQL for Database and Window operating system. The client is written in Ruby 1.8 programming language. The client computer has to be capable of running Internet Explorer 5.5+, or Mozilla Firefox 1.5+.

6.2.4 Description of User Environment

The sequence diagram in Fig 25. shows the sequence of actions for the system and hence describes the user interface.

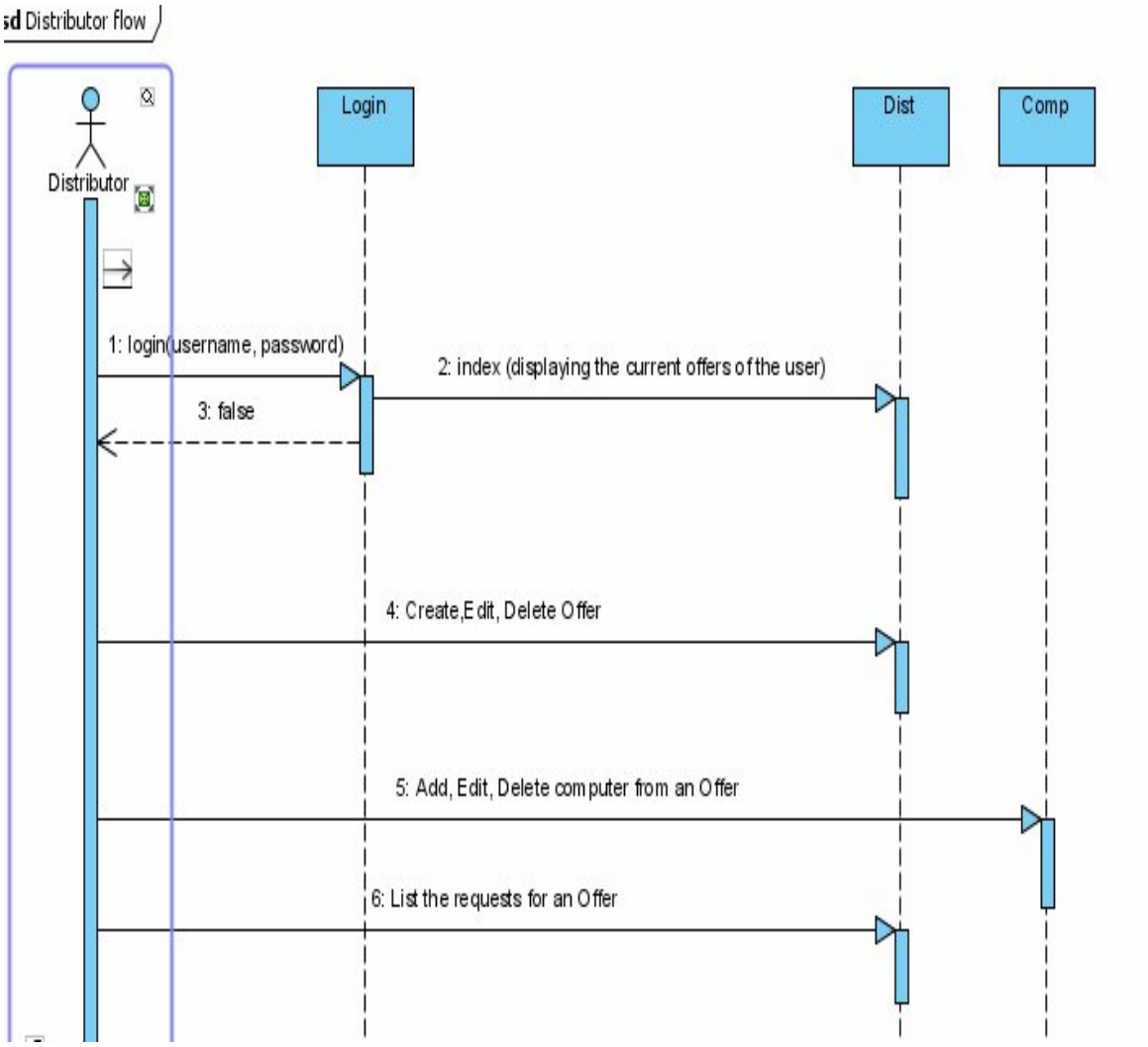

Figure 25: Usage flow for the Distributor

In the figure above, the working flow of the Distributor is presented. Login, Dist, and Comp are the controllers in the application. The Distributor has to login first, action handled by the Login controller. In case of success, the action taken by the system is to display the offers already created by the user.

The Distributor can also edit or delete the existing ones, and also create new ones. Comp handles the management of the computer systems associated with an offer. It offers the same functionality as the Dist controller: listing, creating, editing, deleting.

Fig. 26 depicts sequence of steps of a normal user when interacting with the system to check for available offers.

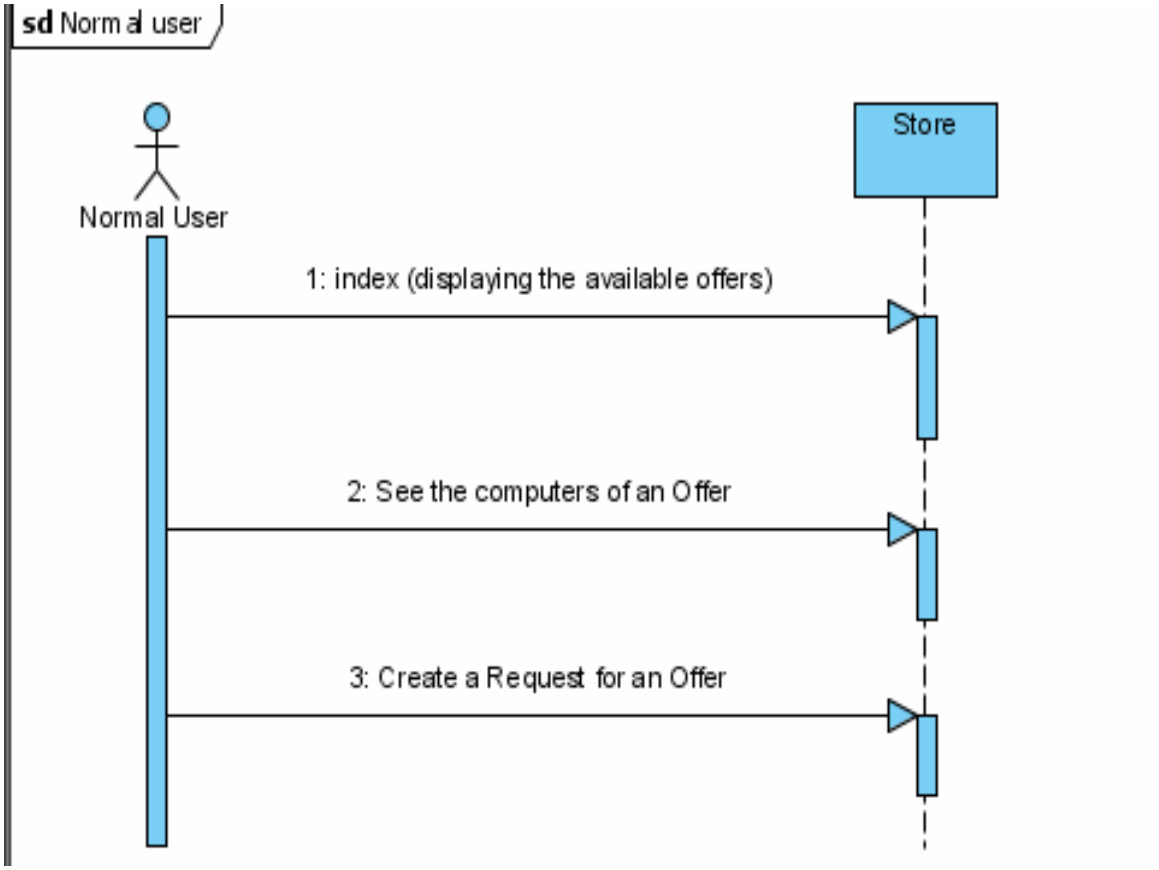

Figure 26: Usage flow for the normal user

6.2.5 Database Structure:

Figure 27 Depicts a database schema used in the application. A user can have zero or more offers. By users, it means the people who provide offers. Each offer can have zero or more computers. Every anonymous user can make a request for an offer, resulting in a many to many relationship. To express this, a third table is used for managing the relationship. A request can have zero or more offers, and an offer can have zero or more requests.

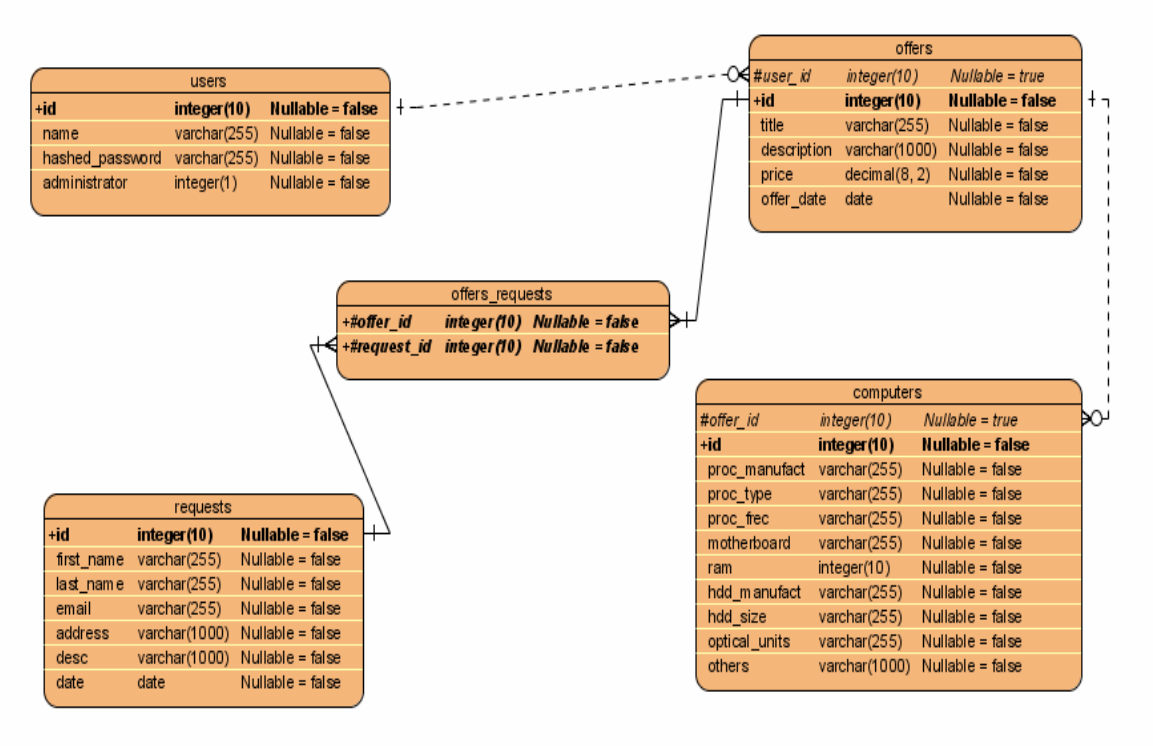

Figure 27: Database schema

7. Discussion

7.1 A point by point discussion from the results

The results of analysis in chapter five have indicated two types of category of schools which involve schools that are government and private owned. The philosophical procurement behaviors of organizations controlling the two categories of schools are different. While the primary purpose of procurement process is to enable procurer have the right works, goods and services in the right place at the right time to accomplish intended mission, the private organizations protects profit margins during the acquiring processes, while the government organizations provides services for the benefits of their citizens. Hence for government organizations managing cost is necessary but legally not for profit. These differences in philosophy are the reasons behind the results of the analysis, as they are the driving forces in the planning and decision towards procurement processes, choice of procurement methods/options, and guideline to use in procuring and the way to solve the challenges faced during the whole processes.

What are types of ICT procurement processes used in secondary schools in Tanzania on implementation of computer studies curriculum provided by the Ministry of Education since 1993. The results in chapter 5 indicates 55% of schools that participated to the survey uses the local shopping, 17% depends on donation from different organizations, 6% indicated the usage of competitive tendering and the 22% indicated not to have knowledge of procurement processes. This results fits to the present study population. It can not be generalized, because some schools are government owned and others private owned.

We have seen in chapter four that the Ministry of Education has provided a guideline PGSEDP to be used on procurement of goods, works and services in a decentralized level, (e.g. all individual schools).

However the idea using local shopping indicate that it is wishful thinking, as when asked on the method used in procuring the ICT equipments, 75% of government schools indicated that they depend on donation from different organization while the remaining 25% through outright purchase where local shopping procurement process could be applied.

In the case of private schools 67% indicated using outright purchase where they could apply local shopping and 22% depended on donation from different organizations, and the rest 11% by leasing then purchase method. The indication of private schools to prefer outright purchase is due to the philosophical behaviors the two category of schools, private schools with funds as income from fees they charge students, hence they have a budget, while government schools concentrate on providing services hence less funding for budget hence dependence on donation.

When did these schools started ICT procurement process and what could be the reasons for delay in starting implementation of the curriculum implantation?. The results indicate that 80% of private schools started using ICT equipments before year 2000 while there was only 20% of government schools in this phase. The pattern changed in second period between 2000 to 2006 where 54% of government schools started using ICT and 46% of private schools.

The ICT policy for secondary education has clearly indicated the reason that caused delay strategically that is lack of trained teachers. This has been taken care by networking all the 32 teachers colleges in Tanzania and starting teaching trainers teachers for schools. Hence from a government perspective, they have prioritized the training of teachers, which will be followed by supplying computers in a centralized systems. This has also been indicated in the ICT policy for basic educations [17]. The increase in number of private schools using ICT is due to the fact that they depend on budget they get as schools fees.

What option and category of ICT equipment has been practically applicable on procurement processes in schools which have managed to implement the curriculum in secondary schools in Tanzania. Cawthera[6] suggested three categories of ICT provision for schools in developing nations, as *using second-hand, using refurbished second hand and using new equipments*. The three categories were used during the analysis to categorise the answers from respondents. In the case of Government school, 50% indicated to use second hand equipment and the other 50% indicated to use new equipments. While the in private schools 34% indicated to use second hand equipment, 33% refurbished second hand equipment and the remaining 33% new equipment. Indication of using new equipments seems to be a wishful thinking, most of schools were using donated and second hand computers.

How does the Government Procurement act affect on ICT procurement process for secondary schools in Tanzania. Going Procurement Guidelines for secondary education development plan 2004-2009, I have learned that, the guideline has relationship with Public Procurement Act No 3 of 2001, because it has adapted its procurement procedures to be applied to decentralized procurement in schools up to a specific limit amount as explained in paragraph 4.4.1 and shown in figure 5. The 6% of respondents who indicated to use competitive tendering in chapter five, indicates to have procurement value above the limit for decentralized schools, hence their procurement is done through the centralized systems of the Ministry of Finance. The extracted part from the government procurement act insist on the government philosophy of accountability. The guideline outline the actors (e.g. HoS, SPC, SB) and their respective amount on money in which they are accountable in authorizing chapter 4, Figure 5.

Does the Ministry of Education provide any specific guideline to secondary schools in order to guide schools administrators in making decision on ICT equipment procurement processes? Three questions were used to check if schools are aware of the guideline provided by the Ministry of Education on procurement processes. The first questions wanted to check if individual schools have knowledge of and are using the guideline from the Ministry of Education.

While the second question asked if schools have separate guideline and the last wanted to validate the knowledge of these guideline by asking them to mention the name of the guidelines. Answers from 26% of the respondents indicated to have guideline from the Ministry and they were using it as reference in their procurement processes. While the other 11% had prepared their own individual guideline and the remaining 63% did not have any guideline either from the Ministry neither individually prepared. This indicates a need of more awareness to be conducted by the Ministry of Education so that more schools are aware of the prepared guideline in order to improve the procurement processes in schools.

What challenges are encountered by secondary schools in the process of ICT procurement in respect of needs assessment, assistance they think could help schools in the procurement processes and ways they think procurement processes could be improved?. The results of analysis shows four main categories of challenges the first is comparing price against quality 12%, then lack of knowledge 41%, cost of ownership 18% and a lack of funds 29%. While in case of needs assessment 46% indicated that vendor decides for them what to buy with only 22% indicating the use of curriculum as a guide in deciding ICT equipment to buy. About assistance which could help schools in procurement processes, 45% indicated the need of Training on procurement processes and knowledge on appropriate ICT equipment, 27% indicated a need of financial assistance and 11% suggested a need for specific vendor to supply ICT equipments to school. Response to a question which asked the ways schools thinks could improve procurement processes resulted into 22% suggesting to have special ICT vendor for schools and more training on ICT procurement.

8. Conclusion

The thesis study has gone through a general literature review related to Procurement Processes of ICT equipment for developing countries. It has strategically reviewed the historical perspective of ICT procurement in Tanzania and analyses of secondary schools in Dar Es Salaam. While the thesis has discussed ICT procurement processes, more emphasis has been on hardware and not software, but ICT comprises hardware (e.g. radio, television, satellite, computers, laptops, mobile phones, personal digital assistance) and software which can be systems software (e.g. windows XP, Vista.) or application software (e.g. Microsoft office, open office.). Assumption have been made that once schools have the required hardware, there are many choices of software proportional to the hardware capacity.

Two contextual approach are found in the ICT procurement process for Tanzanian secondary schools. The Centralized approach, in which the government has strategically started by procuring ICT equipments for 32 Teachers colleges and training teachers, who can become trainers in secondary schools. Decentralizes approach, in which the government, through the Ministry of Education has provided a PGSEDP, as a guide for individual schools when procuring goods, works and services. Both cases made assumption of procuring new equipments. The findings have showed that, both government and private owned schools have procured and uses second hand ICT equipments. The practice has enabled more than 20 secondary schools to start implementing the use of ICT in schools. Lack of financial capacity is a common problem even to private schools which get incomes as school fees from students. A finding from literatures indicates continuous dependence of developing countries on importation of technologies from developed countries. Moore's Law, which predicted a working theory, that shows an increases of power on ICT equipments after each 18 month. This results in production of equipment with new features, which increases frequency of procurement to capable organizations.

Hence a continuous process of giving away their previous used equipments as second hand to schools.

This suggest to the Ministry of education that it is time to provide guidelines (e.g. specification on hardware and software for second hand ICT equipments) for schools when procuring second hand equipments. The thesis covered Dar Es Salaam which has advantages in having access to infrastructures (e.g. electricity supply, wireless connection), it has not covered disadvantageous schools in the villages. However, using the e-adoption model we have seen that even schools in Dar Es Salaam are not yet ready for e-procurement, they are still on an initial stage of using e-mail as a communication technology. Schools in the villages could also use this method to have access to providers appropriate ICT technologies for schools village schools far from ICT infrastructures.

The author becomes a Master of suggested ICT procurement process model for secondary schools in Tanzania. The model brings new approach which is commonly known but have not been implemented, and it can easily be understood, if implemented can make a change in increasing access of ICT technologies to schools in Tanzania. As a future work the author suggest a short term plan in training on the use of e-mail as a basic tool for internal and external communication in the procurement process on ICT technologies, and then a long term plan for all schools creating web sites, to enable schools to publish their needs in educational technologies.

Thesis did not cover important chapter on conflicting, but simple terms (e.g. Obsolete, Second hand, Refurbished, new) in procurement process of ICT equipments. Theses terms can bring fear in making decision if they are not properly differentiated. It time for researchers to give more technical information and provide to stakeholders in education, in order to reduce fear from them in using these equipments, which can cause more delay to younger generations in developing countries to have access to educational technologies, while we still can not produce the equipment locally.

It is my opinion that if implemented, the model can increase more access to ICT to secondary schools in Dar Es Salaam and Tanzania in general. Results from this study population can be useful to stakeholders responsible with planning the procurement processes of ICT equipment in secondary schools in Tanzania.

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Appendix 1 Questionnaires

Q1. What steps are followed in your school on procurement of ICT equipment?

Q2. In which year did your school start using ICT equipment?

Q3. Do you have any guidelines to support the procurement process from the Ministry of Education?

Q4. Does your school have separate guidelines for ICT equipment procurement process?

Q5. What is the name of the guidelines that is used in ICT equipment procurement process in your school?

Q6. Who is responsible with procurement process of ICT equipment in your school ?

Q7. How do you match the specific needs of ICT equipment in your school with **those** available in the market?

Q8. What guides you in deciding the type of ICT equipment to procure for your school?

Q9. In which of the following methods your school procured ICT equipment.

a) Outright purchase from the vendor

b) Leasing then purchase

c) Donation from different organizations

d) Others Please list

Q10. Which of the following category is used in your school when planning for ICT procurement process?

a) using second-hand equipment,

b) using refurbished second-hand equipment,

c) Using new equipment.

Q11. What kind of assistance could help your school in the procurement process of ICT equipment?

Q12. In what way you think the procurement process could be improved?

Q 13. What are the most challenges in ICT procurement process?

Appendix 2 **Application letters from Joensuu university to Tanzania Ministry of Education to do Research.**

University of Joensuu • Finland

TELEFAX

JOENSUUN YLIOPISTO

DATE: 21.8.2007

TO: Ministry of Education and Culture

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NUMBER OF PAGES (including this page) 3

A proposal for cooperation.

Jarkko Suhonen

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RE: COOPERATION IN RESEARCH ON PROCUREMENT PROCESS OF Information Communications Technologies (ICT) EQUIPMENT: a case of Computer Science Teaching in Secondary Schools in Tanzania.

The University of Joensuu, through its Department of Computer Science and Statistics has been conducting a set of courses on **Information Communication Technologies for Development** to its students who are studying in the International Master Program in Information Technology (IMPIT) master degree program.

The plan is underway to upgrade the courses to become an **International Master Programme on Information and Communication Technology for Development.** This programme is intended to be a joint effort between interested universities in Finland and in developing countries like Tanzania. University of Joensuu has a decade long cooperation with the Tumaini University, Iringa University College. In Fall 2007, University of Joensuu in collaboration with the Tumaini University is starting an undergraduate study program in ICT at the Tumaini campus.

In view of the above the University of Joensuu requests to start cooperation with the Ministry of Education and Culture. In this cooperation, the university needs to be in contacts with people **responsible for planning and procurement of ICT equipments** in secondary schools in Tanzania. The researchers at the University of Joensuu will contact these people, so that they are able to cooperate in sharing the knowledge base and participating to research activities. The objective of the research is to come up with **suggestions and decision support model** which will enable stakeholders to decide and provide appropriate devices needed to teach children in secondary schools using ICT. The research period is from 1st September until 31st December 2007.

It is expected that the research activities will extend in future as the need arises from the findings. This is due to the fact that ICTs change very rapidly and its application becomes more common to daily life. Also ICT-based educational systems are becoming more widespread to most schools in developed countries, but its application in developing countries has yet to be seen. However, the interest in and use of ICTs in education appear to be growing despite the challenges faced in developing countries.

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JOENSUUN YLIOPISTO

It is also our understanding from your web site, that The Ministry of Education and Vocational Training (MoEVT) support this view. We have learned that a policy framework for the integration of ICT in basic education: pre-ptimary, primary, secondary, teacher, non-formal and adult education, is in its final stage if not yet ready and some of its statement will cover

- Infrastructure and Technical Issues
- Curriculum and Content
- Training and Capacity Building
- Planning, Procurement and Administration
- Management, Support and Sustainability
- Monitoring and Evaluation

We expect the research results to be useful to different stakeholders responsible for planning and procurement of ICT equipment for teaching computer science in secondary schools in Tanzania.

Mr. Elikana Ngogo, a Tanzanian MSc. student studying in the IMPIT program, is assigned to this research. We would appreciate, if you can establish a contact between him and people involved of planning and procurement of ICT equipments in Tanzanian schools. His contact details are

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Yours Faithfully

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A 1

Elikana Ngogo
C/o Marietha Mkai
S.L.P. 6700
DAR ES SALAAM

13 Novemba, 2007

Katibu Tawala
Mkoa wa Dar es Salaam
S.L.P. 5429
DAR ES SALAAM

YAH: KUFANYA UTAFITI WA TARATIBU ZA UNUNUZI WA VIFAA VYA SAYANSI YA KUMPYUTA KATIKA SHULE ZA SEKONDARI MKOA WA DAR ES SALAAM, KUANZIA TAREHE 15/11/2007 HADI 27/11/2007

Tafadhali naomba urejee kichwa cha habari hapo juu. Ninaomba kufanya utafiti wa ununuzi wa vifaa vya Sayansi ya Kompyuta katika Shule za Sekondari Mkoa wa Dar es Salaam, kuanzia tarehe 15/11/2007 hadi 27/11/2007. Hii ni kutokana na kuchagua Mkoa wa Dar es Salaam kuwa eneo la utafiti wangu. Utafiti huu utaniwezesha kukamilisha Shahada ya Uzamili katika Chuo Kikuu cha Joensuu nchini Finland.

Ni matumaini yangu ombi langu litakubaliwa.

Wako katika ujenzi wa Taifa,

Elikana Ngogo

Appendix 3 Steps in Sealed Bidding and Competitive Bidding Processes.

1. Steps in Sealed Bidding Process:

1. Preparation of invitation for bids(ITB)
2. Publishing of invitation for bids
3. Receipt of bids
4. Public opening of bids
5. Evaluation and comparison of bids
6. Selection of the lowest-priced technically acceptable solution
7. Award of contract

2. Steps in Competitive Bidding Proposal

1. Preparation of request for proposal
2. Release of a public notice of solicitation
3. Receipt of letter of intent and non-bid letters
4. Pre-proposal meeting, mandatory or optional
5. Receipt of proposal and proposal cover letter kept closed in secure place until due date
6. Addenda or amendments to the RFP and eventually, extension of the proposal receipt due date
7. Modification of initial RFP, modification and receipt of proposal and eventually, extension of the proposal receipt due date.
8. Disqualification of proposal, proposal returned un opened
9. Proposal opening at proposal receipt date
10. Rating, Scoring and Sorting proposal in a decision matrix.

11. Selection of the best matching proposal
12. Rejection non-responsive proposal or non responsible providers
13. Provider contacted and requested for their best and final offer(BAFO)
14. Selection of the best matching proposal
15. Decline unsuccessful proposal.
16. Handling of protest letters
17. Award notice.